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INDO-PACIFIC FISHERIES COUNCIL
PROCEEDINGS

9th SESSION
KARACHI
PAKISTAN
6-23 January, 1961

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IPFC Secretariat, FAO Regional Office
for Asia and the Far East
Bangkok
1961

OFFICE BEARERS OF THE INDO-PACIFIC FISHERIES COUNCIL

1961-1962

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Vice-Chairman: *Dr. M.R. Qureshi (Pakistan)*
Member: *Mr. Tran Van Tri (Vietnam)*
Secretary: *Mr. J.A. Tubb (FAO)**

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*Dr. Nazir Ahmad (Pakistan)***
Technical Secretary:
Mr. W.A. Dill (FAO)

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Chairman:
Mr. K.A. Hussain (Pakistan)

PANEL B—SEA FISHERIES

Chairman:
Mr. S. Sivalingam (Ceylon)

HILSA SUB-COMMITTEE

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RASTRELLIGER SUB-COMMITTEE

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CHANOS SUB-COMMITTEE

Chairman:
Dr. H.R. Rabanal (Philippines)

FISH CULTURE IN RICE FIELDS SUB-COMMITTEE

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IPFC TECHNICAL COMMITTEE II

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Dr. G.N. Subba Rao (FAO)

PANEL A—CRAFT AND GEAR

Chairman:
Mr. M.A. Burney (Pakistan)

PANEL B—FOOD TECHNOLOGY

Chairman:
Mr. Lee Bong Nai (Korea)

PANEL C—SOCIO ECONOMICS & STATISTICS

Chairman:
Mr. Abdul Halim (Malaya)

Technical Secretary:
Mr. Y. Miyake (FAO)

FISH MARKETING SUB-COMMITTEE

Chairman:
Mr. N. Oka (Japan)

*The Office of Secretary to the Council is currently discharged by the FAO Regional Fisheries Office for Asia and the Far East.

**Note: Dr. G.A. Prowse (UK) was Chairman during the 9th IPFC Session but Dr. Nazir Ahmad was elected Chairman for the Intersessional Period 1960-61.



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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS



INDO-PACIFIC FISHERIES COUNCIL

PROCEEDINGS

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KARACHI

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SECTION I

**IPFC Secretariat, FAO Regional Office
for Asia and the Far East**

**Bangkok
1961**

	Page
Annex B — FAO : Comments on Report of the International Training Centre on Mackerel (Rastrelliger), 1958	79
Annex C — Thailand : Rastrelliger Tagging Experiment, by S. Bundukhul and Snan Ruamraksa	81
Annex D — Thailand and Vietnam : Report on use of 45-cm Marutoku-B plankton net by NAGA Expedition	84
Annex E — U.S.A. (Hawaii) : Publications on Oceanography, 1959-60	87
Annex F — Vietnam : Etat actuel du Développement et des Recherches de la Pisciculture au Vietnam, 1959-60	89
Part B. Council's Review of Reports and Recommendations arising therefrom .	92
CHAPTER III CRAFT AND GEAR	101
Part A. Report on Inter-session Activities 1959-60 by Technical Committee II, Panel A	101
Part B. Council's Review of Report and Recommendations arising therefrom .	135
CHAPTER IV FOOD TECHNOLOGY	139
Part A. Report on Inter-session Activities 1959-60 by Technical Committee II, Panel B	139
Part B. Council's Review of Report and Recommendations arising therefrom .	172
CHAPTER V SOCIO-ECONOMICS, STATISTICS & MARKETING	176
Part A. Report on Inter-session Activities 1959-60 by Technical Committee II, Panel C	176
Part B. Council's Review of Report and Recommendations arising therefrom .	238
CHAPTER VI RECOMMENDATIONS	244
A. To Member Governments	244
B. To F.A.O.	246
C. To Executive Committee and Secretariat	248
D. To Technical Committees	248
E. Technical Assistance	250
Appendix I List of Delegates and Observers	251
Appendix II IPFC Nominations for the period between the 9th and 10 Sessions	256
Appendix III List of Documents	265
Appendix IV Amended Agreement and Rules of Procedure of the Indo-Pacific Fisheries Council	275

INAUGURAL SPEECH BY Lt. GENERAL K.M. SHAIKH,
MINISTER FOR FOOD AND AGRICULTURE
GOVERNMENT OF PAKISTAN, AT THE
NINTH SESSION OF INDO-PACIFIC
FISHERIES COUNCIL, KARACHI.

Mr. Chairman, Your Excellencies,

Ladies and Gentlemen,

I am happy that the Indo-Pacific Fisheries Council is holding its 9th Session at Karachi. On behalf of my country I extend a hearty welcome to the visiting delegations.

The existence of an organization like the Indo-Pacific Fisheries Council is particularly important to the developing countries of this region as their need for technical assistance is very considerable. The world catch of fish has increased considerably during the recent years and now exceeds 36 million tons. While Peru and the mainland of China have a considerable share in this total, most of the increase has come to the share of the developed countries. The countries of this region, therefore, have still to go a long way to get their proper share in this development.

The diet of the common man in the Indo-Pacific Region is low in protein value and the share of fish food in his diet is also very small. For instance, the per capita consumption of fish in Pakistan is about five pounds per annum as against forty pounds in U.K. and 92 pounds in Japan. Obviously we have to raise our rate of consumption by producing more fish and arranging its proper marketing. There is a great need for a sound administrative machinery to bring this about. I am glad to see that you are holding a symposium on "fisheries management and administration", to discuss the various aspects of this problem.

We have been concerned with the need for quick development of our fishing industry not only to improve the diet of our people, but also for earning more foreign exchange so badly needed for development. The present situation

in our country is capable of greater improvement. Our delegates will give you the details of the steps that our Government is taking to improve the position. Some of the salient features are as follows.

We have a coastline of 500 miles in West Pakistan and 200 miles in East Pakistan. Recent surveys have shown that the water along the coastline and the deeper waters beyond, contain large aquatic populations. The rivers of East and West Pakistan have supplied fish from times immemorial. In East Pakistan tank fishing has been an ancient practice. Efforts have been made recently to introduce this in West Pakistan also. The development of this work, however, has raised many problems, some of which, I am glad, are included your agenda.

The surveys of marine fisheries resources in West Pakistan started a few years ago. The assistance of the FAO and the Government of U.S.A. has been invaluable in this work. These surveys have so far indicated that the resources are large but we have not yet succeeded in charting the areas where the best fish is available nor have we been able to study the movement of fish. The problem with us is to find the best method of expeditions and surveys and I feel there is a case for joint action in developing a machinery for the purpose.

We have recently built a fish harbour at Karachi and are planning to build another in East Pakistan. It will be equipped with modern machinery and provide other facilities to our fishermen. Efforts are also being made to concentrate fishing industry around this harbour to enable quicker disposal of fish catches. A fishermen's cooperative exists in Karachi which is undertaking assistance through credit, mechanisation of boats and provision of other fishing gear. Con-

siderable progress has been made in this sphere but much remains to be done. The fishermen of Mekran coast and East Pakistan have still to be provided with more facilities. There is also the need for training of these fishermen in the adoption of modern methods and in provision of sufficient assistance to them so that they could be released from the control of the middleman. Any suggestion to enable us to quicken this process would be most welcome.

Modern developments of irrigation works in many of our countries have resulted in a change in habit of migratory fish. The existing information on these habits is, therefore, becoming outdated. Here again, it will be of value to find out the best method of expediting surveys so that the possibilities of increase of fish population in rivers may be exploited.

I saw with considerable interest that you have a Special Sub-committee on production of food fish in rice fields. We have already experimented on this in the rice fields of East Pakistan but so far we have not achieved any worthwhile results. Your recommendations on this behalf will be of special interest to us.

The re-organisation of tank fishing in East Pakistan has been engaging the attention of the Government of this country for some time. The extension of fishing in this field depends upon efficient supply centres so that private enterprise can get ample fish fry. Here again your technical assistance is important.

Marketing of fish is an important problem in countries of the Indo-Pacific Region. This necessitates the establishment of cold-storages, ice-plants, provision of insulated vans and in-

sulated boxes. All these arrangements need a considerable amount of foreign exchange. It is, therefore, necessary to find the most economic method.

The outlook of the fisherman needs to be changed. It is important that he is rescued from his present poverty and backwardness. We have recognised the urgent need to provide him with easy credit facilities and as a beginning it has been decided to have a revolving fund of Rs. 2.5 millions for this purpose. We have also exempted his fishing requirements from all taxes with a view to encouraging him to acquire better fishing gear. There is a considerable labour force available at our disposal and the foreign experts who have visited our country have been struck with the skill and proficiency of our fishermen in the use of traditional equipment. There seem to be no reason why, if they are provided with requisite facilities and knowledge, they should not adopt modern methods. I am sure these problems exist in other countries of the region also and the exchange of information on the steps taken in those countries will prove invaluable.

We are grateful for the assistance given by the FAO and your Council. I would emphasise that technical advice is urgently needed in most of the countries of the area you represent. Fisheries is one of the quickest items of development and I will endorse the remarks of Dr. Finn, Director of fisheries of FAO, that "economic returns from water would be much greater than that of an equivalent area of land". I therefore, look forward to the results of your deliberations with very great interest.

I now declare open the Ninth Session of the Indo-Pacific Fisheries Council.

ADDRESS BY DR. B.R. SEN, DIRECTOR GENERAL OF THE FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS.

**Your Excellency, Mr. Chairman
Ladies and Gentlemen,**

It is with deep regret that I find myself once more unable to attend the Session of the Indo-Pacific Fisheries Council. I am sure, however, that you will all appreciate that the intensive programme which is being developed in connection with the Freedom From Hunger Campaign is making a heavy demand upon my time. However, I feel confident that the highly qualified Delegates who are assembled for this 9th Session of the Indo-Pacific Fisheries Council will deal with the problems before them in a manner no less competent and productive of results than their predecessors at previous Sessions of the Council.

I am sure that no one can appreciate more deeply the significance of the work needed to develop the fisheries industries of the Indo-Pacific Region than the men who are here assembled. I have been informed that the programme of work of the Council is extremely varied and that no aspect of significance in fisheries development is being overlooked. The recent FAO Regional Conference, held in Saigon in November last year, has drawn particular attention to the great problems confronting the development of efficient Fisheries Administrative Services and the need

for increased facilities for the training of Fisheries Administrative personnel.

The great advances made in fisheries production through the mechanization of the fishing boats and gear have not as yet been paralleled by similar advances in the marketing and distribution of the catch. I have been informed that this Session will pay particular attention to these matters and I look forward with considerable interest to the outcome of your studies and deliberations.

It is, of course, of the greatest importance to me and to the Food and Agriculture Organization that conferences of this nature should be held, with the basic objective of providing increased supplies of essential foods to the peoples not only of this Region but of the World and it is such Councils as this which can and do make valuable contributions to the Freedom From Hunger Campaign.

I would like to take this opportunity to extend to the Government of Pakistan the most cordial and sincere greetings and to express FAO's gratitude for the assistance, courtesy and hospitality which is being accorded to the delegates and the staff of the Indo-Pacific Fisheries Council.

I wish you a happy, successful and productive Conference.

STATEMENT BY MR. N.M. RASHED, ACTING DIRECTOR
UNITED NATIONS INFORMATION CENTRE FOR PAKISTAN,
KARACHI.

**Mr. Chairman, Excellency, Honourable
Delegates, Ladies & Gentlemen,**

I have great pleasure in welcoming you, on behalf of the United Nations, to this Ninth Session of the Indo-Pacific Fisheries Council which, as an important special group of the Food and Agriculture Organization of the United Nations, is promoting international co-operation in the development and proper utilization of fisheries resources in the Indo-Pacific region. We are also grateful to acknowledge the hospitality granted by the Government of Pakistan to this meeting of the Council, the personal interest shown by His Excellency General K.M. Shaikh, Minister of Food and Agriculture and the assistance provided by the Director of Fisheries and his able staff, in the organization of this meeting. There can be no doubt about the need for meetings such as this and for their rotation in different countries of the region, as a means of stimulating the widest public interest in the ideas and concepts which form the basis of the work of the United Nations, the Food and Agriculture Organization and Member Governments in the field of fisheries. It is our belief that, as at its previous sessions, the Council will succeed in enlarging the co-operative efforts of the Government concerned in utilizing the special knowledge relating to the living resources of water as gathered from time to time by the Council with the help of the Governments of the region and through its own research projects.

You have a wide range of subjects for discussion on your Agenda. The United Nations

Economic Commission for Asia and the Far East which has always shown a keen interest in the development of fisheries in the region, has asked me in addition to draw the attention of the Council to some of the pertinent portions of the report of the Sixth Session of the working Party on Small-Scale Industries held in Singapore in March last year, in relation to fish. During its discussion on the food industry potentialities in the region, i.e., availability of foods and packing media, etc., the Working Party noted that the fish was usually caught by inshore fisheries in such small numbers of each variety as to be unsuitable for the establishment of canning industries. The Working Party therefore suggested that possibilities of canning in the form of fish cake and fish fingers may be explored. Also, among its other recommendations in relation to the increase of food productivity of the region the Working Party suggested that the means for more deep sea fishing may be considered. The Economic Commission for Asia and the Far East thus hope that the Council will, among other things, go into these questions during its forthcoming deliberation and make suitable recommendations.

I thank you, ladies and gentlemen, for having given me this opportunity of addressing you briefly as a representative of the United Nations to this meeting. We are confident that your discussions of the problems in front of you will further contribute to the prosperity of the region, in line with the purposes and principles of the Charter of the United Nations. Thank you.

MESSAGE RECEIVED FROM DR. D.B. FINN,
DIRECTOR, FISHERIES DIVISION, FAO, ROME

CHAIRMAN, INPAFICO, KARACHI

PLEASE CONVEY EXPRESSION OF MY HIGH REGARD TO HIS EXCELLENCY THE MINISTER FOR FOOD AND APPRECIATION TO GOVERNMENT OF PAKISTAN STOP GREETING AND BEST WISHES TO DELEGATES OF NINTH SESSION STOP I AWAIT WITH DEEP INTEREST RESULTS OF DELIBERATIONS ON LONG AND VARIED AGENDA.

ADDRESS BY THE CHAIRMAN
OF THE INDO-PACIFIC FISHERIES COUNCIL
MR. TRAN-VAN-TRI

Chief of the Water Resources Exploitation
Service, Directorate of Fisheries,
Saigon, VIET-NAM.

**Excellency, Distinguished Delegates,
Ladies and Gentlemen,**

My happiest duty is first to express my sincere thanks to the Government of Pakistan for the hospitality and facilities generously granted to the Indo-Pacific Fisheries Council to hold its 9th Session this year at Karachi. To the Council, I would request my dear colleagues and distinguished delegates to accept my grateful thanks for the honour you reserved to me by electing me as Chairman of the Council during the period of 1959-1960.

I am glad to be entrusted to maintain the continuity of the brilliant work initiated and developed by my eminent predecessors, thanks to whose guidance the Council has become nowadays a very useful organisation and is concerned more and more with the practical daily problems of fishermen. Fisheries workers in the Region have found and will find good sources of help in the Council recommendations promulgated through its general sessions.

The Council covers a very broad field of activity starting from scientific research work in the laboratory and leading to the final state of consumption of fisheries products through various technical operations involved in capture, handling, marketing, processing and preservation. It is needless for me to trace again the various and valuable contributions of the Council accomplished during the 12 years since its creation in 1948. I would rather try now to bring up for your consideration some of the problems encountered in terms of time and new techniques adopted recently by the industry in the Region.

As regard to production and marketing of fish, the two activities are progressing in parallel in most countries. However with the utilisation

of synthetic fibers as net material and the motorisation of fishing craft, it seems that at least, in the past few years, the production is increasing at a faster speed than are the results of efforts made for the re-organisation of the market, regardless of the general rule that marketing plays a determinative role in any kind of business we undertake. Information from fishermen, especially of Viet Nam, shows that, supplied with motored boats and synthetic fiber nets they can catch from 100 to 300 % more fish than before, a quantity which cannot be easily absorbed by the market. Obviously, we should keep in view the urgency of establishing an efficient marketing organization in our fishery policy, otherwise the interest of the producers will be effected, so that discouraged and beset by the souvenirs of their previous unhappy experience, they may become reluctant to make any further efforts at the prompting of the Government.

Fisheries statistics also are not less important. The lack of statistics may be one of the main reasons why fisheries industry has seldom received the support it deserves. To obtain support and due consideration for fisheries programmes, we should have in hand accurate figures to show distinctly the real income from the fisheries industry and the budget allowed for its development. Governments generally do not deliberately overlook the needs of the fisheries, but the absence of precise reliable figures and information makes difficult the task of fisheries officers to convince the Government of the very real importance of that industry.

Along the line with the development of fisheries and considering the rapid advancement of every branch of the industry, the programme for the training of technicians must be now one of our urgent objectives. The need for a much greater number of scientists, technicians, admi-

nistrators and master-fishermen is imperative at the present time. Following the intensification of the exploitation of coastal waters by means of modern techniques and equipments, fishermen will be urged accordingly to extend their field of activity from coastal to oceanic waters and in such operations, scientific knowledge on water and fish and the establishment of a cadre of qualified master fishermen are indispensable.

Speaking on the work of the Council, you are aware that the Council has been considerably handicapped by the lack of support from members of the various Committees and panels during the intersession period. That state of apparent inactivity may be due partly to the fact that technicians of the region are often overloaded by the daily work assigned to them at home. However I believe that the Council will be much more efficient if the Secretariat could receive technical information more regularly from the workers in member countries. During the recent meetings of the Executive Committee, it was also reported that the lack of up-to-date information restricts the activities of the Chairmen of Committees I and II. It was also found that, quite often, the Secretariat has not been adequately supplied with material to insert in our 'Current Affairs Bulletin' which I believe is a valuable and most appropriate means for the exchange of general and technical fisheries information among us. I would like once again, gentlemen, to submit this problem of Council's inactivity during the intersession period for your serious consideration.

To aid in your approach to the work of the present session, I would like to offer my earnest opinion that the impressive list of technical problems presented for consideration should be scrutinized in the sense :

— that the fisheries industry in this Region, at this moment at least, should not be assessed by the standards which have developed in the advanced regions such as the North Atlantic.

— that critical discrimination is required in deciding the actual works to be carried out or in selecting the researches to be conducted for the different objectives, whether for the stabilization or for the development of the fisheries industry.

— and that the work could hardly be accomplished without increasing the existing facilities and personnel.

In short, let us try to think seriously of what is practicable, but not dissipate our energies in discussing presently unattainable ideals.

Finally I would like to emphasize the very significant fact that the fisheries industry in this Region is now evolving rapidly towards the full mechanization of vessels and gear. We are entering the most delicate stage where prudence is needed and all available experience must be drawn upon. Whatever the subjects we handle and whenever we work, a too rapid evolution often induces a disadvantageous or even hazardous result if foresight and care are not exercised. During the time we are together here, I deeply wish, in consequence, that you will furnish the Council with advice and exchange ideas to the limit of your knowledge and experience for the benefit of all of us.

Before closing, I wish once more to express my sincere thanks to the Government of Pakistan and to all distinguished delegates, guests, and observers who have come to attend the present meeting of the Indo-Pacific Fisheries Council.

I would not miss seizing this opportunity to express on behalf of the Council our deep sympathy to the fishermen of East Pakistan for the sufferings endured by them as a result of the great cyclone and would be grateful if an expression of our condolence could be conveyed to the sufferers.

Thank you.

CHAPTER 1 COUNCIL PROCEDURE

AGENDA

1. Business of the Session
 - 1.1 Adoption of the Agenda
 - 1.2 Report on Credentials
 - 1.3 Nomination
 - 1.31 Technical Committees
 - 1.32 Council Administrative Correspondents.
2. Statements by Delegations.
3. Report of the Executive Committee
 - 3.1 Membership
 - 3.2 Relations with International and other Organizations
 - 3.3 Council's Report to FAO
 - 3.4 Publication and Editorial Policy
 - 3.5 Financial and Budget Report
 - 3.6 Implementation of Council Instructions and Recommendations.
4. Amendments to the Agreement and Rules of Procedure
 - 4.1 Amendment proposed by Netherlands Government
 - 4.2 Amendment in conformity with FAO Conference Resolutions.
5. Reports of Technical and Sub-Committees
 - 5.1 Technical Committee I
 - 5.2 Technical Committee II
 - 5.3 Fish Marketing Sub-Committee
 - 5.4 Hilsa Sub-Committee
 - 5.5 Rastrelliger Sub-Committee
 - 5.6 Chanos Sub-Committee
 - 5.7 Fish Culture in Rice Fields Sub-Committee.
6. Inter-Session Meetings of Technical and Special Sub-Committee.
7. Time and Place of 10th IPFC Session.
8. Election of Chairman and Vice-Chairman.
9. Symposium for 9th Session.
10. Proposals for Symposium of 10th Session.
11. Other Business.

The 9th Session of the Indo-Pacific Fisheries Council was inaugurated by the Minister for Food and Agriculture Lt. General Khalid Mahmood Shaikh in the Pakistan National Assembly Hall, Karachi at 1000 hrs. on Tuesday, 9 January 1961.

Following a reading from the Holy Quran, the Chairman introduced the Minister to the Delegates and Guests and requested him officially to declare open the Ninth Session.

In an address recorded in the introduction to these Proceedings, the Minister formally inaugurated the Ninth Session.

The Chairman then presented a Presidential Address, which is recorded in the Introduction to the proceedings.

At the request of the Chairman, Mr. Ijaz Ahmad, FAO Country Representative in Pakistan, delivered a message from Dr. B.R. Sen, Di-

rector General of the Food and Agriculture Organization of the United Nations. This message is recorded in the Introduction to the Proceedings.

On behalf of the United National Organization, Mr. N.M. Rashed, Acting Director of the U.N. Information Centre, Karachi, read a short statement, recorded in the Introduction to the Proceedings.

The Secretary then read a cable message for Dr. D.B. Finn, Director, Fisheries Division, FAO.

In accordance with a resolution of the 6th Session, official statements from Delegates and Observers were tabled, and not presented verbally. The salient points of the statements are given in the following paragraphs.

The Delegate for Australia explaining, that the Commonwealth and State authorities were responsible for the Administration of fisheries,

said that in general, the Commonwealth Government was responsible for the administration and development of Australia's marine resources in extraterritorial waters while the State Governments were concerned with territorial waters and inland fisheries. In five Commonwealth Acts, provision was made for fisheries administration and fisheries management programmes to develop in collaboration with the State authorities and the C.S.I.R.O. Division of Fisheries and Oceanography, which was responsible for biological research and fundamental investigations. The Fisheries Development Trust Account was used to aid in developing fisheries where private enterprise had been unable or unwilling to provide the necessary capital. A programme of extension services was developing and field surveys to test commercial possibility of certain fisheries were under way. New projects included the setting up of a Committee to examine the possibility of introducing a uniform statistical system throughout Australia; the examination of the practical implications and cost of establishing a training course for field officers and extension workers; the enlargement of the Fisheries Newsletter; and the setting up of a Committee to examine all aspects of the pelagic fisheries in the South-East Australia Area. Australia followed with interest the work of FAO and IPFC and hoped that the endeavours of these organizations would assist the development of fisheries in the Indo-Pacific area.

The Delegate of Ceylon stated that the programme for the development of the fisheries of the Island to reduce imports and to achieve ultimate self-sufficiency was being proceeded with.

The programme for the introduction of new mechanised boats had progressed satisfactorily and there were now about 500 such boats in operation. There would probably be a thousand boats at the end of 1961. The result of this programme had been the rapid growth of boat yards and an increase in the number of persons who were competent to build boats to western designs. Steps were being taken to provide fisheries harbours and the ancillary facilities that were needed for the expanding industry. The existing regula-

tions for the registration of fishing vessels were not adequate but were being revised to suit the new conditions. The Fishermen's Accident Compensation Scheme had been in operation satisfactorily and had been of much assistance to those who have been in need of help.

The extension service had been strengthened with particular emphasis on the training needed for the new techniques associated with the new mechanised craft, including training on the operation and maintenance of marine diesel engines. The expansion of the fresh and brackish water fisheries was being continued and a brackish water station had been recently set up. The research division of the Department of Fisheries continued its work on biological and technological research. There had been a steady increase in fish production over the last two years.

On behalf of his Government, the Delegate for Ceylon wished to thank the Government of Pakistan for its hospitality and expressed its appreciation of the excellent arrangements that had been made for the conference.

Le Delegué du gouvernement de la République de France déclare que son Gouvernement profite de l'ouverture de la 9^e session du Conseil Indo-Pacifique des Pêches pour assurer tous les participants de son concours chaleureux dans les travaux qui vont y être entrepris.

Il prend acte et se rejouit des succès déjà enrégistrés dans divers domaines et plus particulièrement dans les questions se rapportant à la standardisation des méthodes d'étude du plancton, travail qui fut mené à bonne fin à la suite d'une recommandation formulée lors de la dernière session du Conseil.

Il souhaite naturellement que cet effort vers l'adoption de termes de référence uniformisés pour chaque sujet d'étude se poursuive et s'étende à d'autres branches des recherches et de leurs applications. C'est l'évidence que préalablement à toutes les confrontations, à toutes les discussions, il convient avant tout de s'entendre sur les mots employés et sur la signification qu'ils peuvent revêtir dans l'esprit des uns et des autres.

De même il est hautement désirable qu'au cours de ces réunions se manifeste une atmosphère de mutuelle confiance et de sympathie car elle constitue le facteur le plus efficace de la progression des débats; l'expérience tirée des précédentes réunions nous l'a suffisamment montré. En effet, jamais la diversité des communautés mises alors en présence n'a constitué un obstacle à une collaboration amicale entre leurs membres pour la raison principale qu'à chacun était accordé l'opportunité de connaître ses différents collègues et de s'en faire connaître, et le moyen de la comprendre et de s'en faire comprendre grâce surtout à l'emploi des deux langues officielles, l'anglaise et la française.

Le Conseil Indo-Pacifique des pêches, par ce caractère bilingue, a reçu la plus large audience dans cette partie du monde et, de surcroît, il a permis à ses participants qui relèvent de l'un de l'autre de ces deux groupes linguistiques d'aborder entre eux les questions les plus ardues et de les pousser à fond sans crainte du malentendu fâcheux inséparable de l'interprétation approximative, sans risque du gaspillage d'un temps parcimonieusement compté.

Aussi, dans l'espoir que les mêmes conditions de travail puissent se retrouver lors de cette nouvelle session, le gouvernement de la République Française exprime sa satisfaction de savoir réuni le Conseil Indo-Pacifique des Pêches et lui confirme sa solidarité dans les buts poursuivis et dans les tâches entreprises.

Presenting a statement on the status of the fishing industry, the Delegate for the Government of India pointed out that fisheries development programmes in India had been considerably expanded during the last two years. Though fish production in 1959 was affected to some extent by the scarcity of oil sardine and mackerel, these two fishes were occurring in large quantities this season and it was expected that the target of production of 1.4 million tons to be attained by the end of the Second Five Year Plan period would be reached.

There was increasing activity in the development of inland fisheries, with an estimated production of about 2.75 lakhs tons. High prio-

rity was being given to the production of quality fish fry for stocking pounds. Additional centres of fish-seed production were also established. Considerable progress in river basin development had been made in several states and improved methods of fishing were being developed in some of the reservoirs. Research on inland fisheries was continuing and the fisheries extension service was being expanded.

There was considerable development in marine fisheries by supplying marine diesel engines to fishermen at subsidized rates and the extension of facilities for the import of engines, especially for cooperatives and other groups of fishermen. The mechanisation of fishing gear was becoming more popular and the Government had set apart funds to allow the import of fishing equipment. Work was being undertaken with the assistance of FAO to develop new fishing harbours and offshore fishing stations were being investigated.

Beach-boat trials were progressing and research in marine fisheries was expanded. Technological studies of fish curing, transportation and marketing were being developed to cope with the increased landings. Research studies in this field were being undertaken. Attention was being given to problems of fish marketing and six refrigerated rail vans which were in operation.

The Government of India was establishing a Higher Training Institute for fisheries officers at district levels, with the assistance of U.N. Special Fund. The existing course on Inland Fisheries continued to give training to candidates sponsored by the State Governments and by some of the neighbouring countries.

Training for candidates for Skipper's and Mate's tickets was being given on the fishing vessels belonging to the offshore fishing stations. In addition to the two six months' courses in fishing boat designs and construction, an advanced course of three months was conducted in fishing craft designs; the candidates were now employed in the maritime states. The Central Fisheries Technological Research Station was now providing a training course for carpenters

in understanding the designs and following the lines of construction. Training was also given to nominees from States in the design, fabrication and operation of shrimp trawls from small power-boats.

The Delegate for Indonesia conveyed on behalf of the Government of the Republic of Indonesia, sincere thanks to the Government of Pakistan for their gracious invitation to hold the 9th Session of the Indo-Pacific Fisheries Council in the city of Karachi. It is indeed a great idea of the Organizing Committee to choose the compound of the Fish Harbour as the proper site for the meetings and he was convinced the fish and fisheries atmosphere prevailing in this compound would serve as stimulating agents for bringing this 9th Session to a very successful end.

The Indonesian Government realised the great importance of the IPFC and its sessions in solving major problems in fisheries encountered by countries in the Indo-Pacific region in general, and by Indonesia in particular, and it would normally be expected that all member countries would thus be represented at each session. But unfortunately, however, the Indonesian government was not in the position to be represented at the 8th session held in Colombo, Ceylon two years ago, which was deeply regretted.

Indonesia had just embarked upon the first National 8 years Plan, covering the period 1961-1968. A couple of days ago, at the New Year, President Soekarno had the honour to swing the first mattock into the Indonesian soil as a symbol of the commencement of the first Eight-Year Plan and as a National command to do the utmost for a full realization of the Plan. The production of fish and fish-products as one of the most important sources of animal protein should at least be doubled, a gigantic task put upon the shoulders of fisheries workers, fishculturists and fishermen. The awareness of the necessity of achieving the target in order to be able to improve the daily menu of the Indonesian people for building up a healthy and stronger nation, compelled Indonesian fisheries workers, to do their utmost and to seek for means and ways for fulfilling the task. He was strongly of the opinion that experience

gained and results of research achieved by fisheries scientists of the world in general and by scientists in this region in particular would be of great value and help to Indonesian fisheries workers in acquitting themselves of their task. Technical deliberations and discussions during the Ninth Session and during the Sessions to come would certainly enrich the knowledge and improve the technical know-how of the Indonesian delegation.

Though Indonesia was an archipelago, consisting of islands full of fertile inland waters and the islands themselves surrounded by seas rich in fish and other edible aquatic animals, the present production of fish and fish products was barely sufficient to meet 40% of the maximum requirement of the fast growing population. Inadequate know-how on exploitation of resources and fisheries management was one of the major handicaps, and any attempt from the part of the Council in having a seminar or training centre established on this topic, would be highly appreciated.

In conclusion the Indonesian delegation expressed its sincere gratitude to the Executive Committee and the Secretariat of the IPFC for all the work so excellently done in the last year and to the Organizing Committee for the splendid arrangements of the session and the cordial reception of the delegations. He was sure the stay in Pakistan would be very pleasant and would like to request the Committee and the Pakistan government to "Pakistan Zindabad".

The Delegate for Japan expressed his heartfelt thanks first of all for the strenuous efforts made by the FAO Secretariat and IPFC Secretariat to convene the 9th Session of the Indo-Pacific Fisheries Council and for the kind sponsorship of the Pakistan Government which had arranged for the great occasion in this country.

In the dietary life of the Japanese people, over 70 per cent of animal protein is taken from aquatic products. The total intake of animal protein per capita, however, amounts to little compared with that of those people in Western countries. Such a situation was creating an in-

creased necessity for utilizing fisheries resources to the full extent.

In view of the recent remarkable increase of the national income of Japan it had become an important problem for the Government of Japan to help increase the earnings of fishermen up to the same level as those of workers in other industries.

Under these circumstances, the Government had so far taken overall steps for increasing the sustained productivity of fisheries. Especially the Government had been concerned with the development of unexploited marine resources, the promotion of fish culture and improvement of processing and marketing facilities so as to make possible an increase in demand for fisheries products, keeping pace with the modernization of the food consumption pattern.

For the implementation of these technical measures, intensive and extensive scientific research works were considered all the more necessary in such fields as fisheries and fish-culture as well as the processing and storing industries.

He was confident that the interchange of the techniques and the result of researches to be undertaken at this Council by experts of all participant countries in the spirit of co-prosperity of the Region would be extremely useful for the improvement in the utilization of the world's aquatic resources, and desired that such activity of the Council be promoted for the years to come.

The Delegate for Korea considered that it was indeed a great privilege to bring to the Council greetings and best wishes of the Government of the Republic of Korea for the greatest possible success of the Ninth Session of the Indo-Pacific Fisheries Council at Karachi, Pakistan. On behalf of the Korean Delegation he expressed his gratitude for the heart-touching hospitality and the warm welcome by the Government of Pakistan. His gratitude went also to all members of the IPFC Secretariat and the Executive Committee for their untiring efforts in making this significant session possible in the beautiful city of Karachi. The Korean Government espoused the

spirit and objectives of the Council and would continue to look to the Council for initiative, never-ceasing inspiration and kind guidance for the further development of not only Korean fisheries industry but also those of Member Governments in the area.

As delegates were all aware, Korea stood on the threshold of a new area for progress and prosperity, particularly in the field of fisheries industry following the April Revolution. Since the fisheries industry was second to agriculture in importance in Korea, Government paid special attention to the furtherance of fishing technology and fishing gears for the purpose of raising the living standards of fishermen. To this end, the Korean Government rendered all possible financial assistance and government subsidies, together with close cooperation with other related industries.

A five-year fisheries plan was underway to explore the possibility of exploitation of fisheries resources in the tidal areas. The future of the Korean fisheries industry was very hopeful and optimistic.

The fishing fleet which had to be rebuilt following the Korean War, and had been devastated by several typhoons since then, continued to be rebuilt and modernized in spite of all adversities. Government technologists accompanied vessels on fishing voyages to teach and train crews in new methods and the use of modern equipment.

New shore facilities, such as processing and cold storage were being built, many with the help of government loans and subsidies. However, these were still not sufficient to make fresh fish available to all of the citizens of Korea. Marketing and distribution of fisheries products were receiving close attention to help improve this situation as also was the expansion of local and foreign markets and promotion of new products.

The Korean FAO Association included a fisheries committee consisting of over one hundred members from various fields to advise the Government on fisheries programmes and

technology and in the dissemination of technical and academic information.

The delegate for the Federation of Malaya expressed the appreciation of his delegation for the excellent arrangements made by the Government of Pakistan and the IPFC for the holding of this Conference. They were grateful for the opportunity afforded by the meeting of the Council to be associated once again with delegates and representatives of Member Governments and other organizations in the free discussions and exchange of views and information on fisheries problems of the region.

The Federation of Malaya had been closely connected with the work of the Indo-Pacific Council since its inception, first as a member of the U.K. delegation and later as a full Member. The work of the Council in its different fields has been of great help and inspiration to it in the development of its fisheries.

Although fisheries could not claim the same economic importance as tin and rubber in Malaya, it nevertheless had a very important part to play in the national economy. Some 50,000 fishermen on a coastline of 1,500 miles long, landed a total of 125,000 tons of fish annually valued at M \$ 150,000,000. Moreover fish was the only protein acceptable to all people, irrespective of religion or creed.

The Federation of Malaya was continuing its programme of mechanisation of fishing boats. There were now some 5,000 outboards and 4,000 inboards. This development in turn had focussed attention on the need to provide landing jetties, navigation lights at river-mouths and rest houses for fishermen on offshore islands so that they might extend their area of operations.

Some of these facilities had already been provided and more were being planned in the 1961-1965 Development Programme.

Emphasis was laid on the training of fishermen and two fisheries schools had been built. The one at Penang was opened recently in the presence, among other dignitaries of Dr. B.R. Sen, Director-General of FAO and Dr. D.B. Finn, Director of FAO Fisheries Division. Fishermen's

Cooperative Societies had been formed and were being provided with marketing facilities and central landing points for marketing catches. Canadian Colombo Plan Aid had been enlisted to build six cold storage and registration depots on the East Coast beginning about March 1961. Two ice-plants each producing 20 tons per day, one on the East Coast and one on the West Coast were now owned by fishermen's cooperatives. These represented the first venture of fishermen's cooperatives into the important field of ice-manufacture in Malaya.

A joint Malayan-Japanese tuna fishing and canning company, set up in Penang, was canning tuna for export to Europe. A Japanese tuna fishing expert had been attached to the Fisheries Department for the last two years on a survey of tuna fishing resources around the coast. Indications were that there were no tunas of economic importance, apart from skipjacks, within the area now exploited by the Malay fishermen. There were, however, sizeable stocks of marlins on the East Coast near Tioman Island.

To develop the oyster farming industry, a Japanese oyster expert had just been obtained under the Colombo Plan.

Fishing stakes, an important gear in Malaya, are however, often a great danger and hazard to drift-fishing and purse-seining since derelict poles are left behind on the sea-bed. To find a substitute for stake fishing, a Colombo Plan Japanese set-net expert had been recruited.

Research on marine and freshwater fisheries and technology was being prosecuted. Shortage of staff had limited the scope of work. However research had been carried out on the Cockle (*Anadara granosa*), the *Rastrelliger* fishery, the culture of the giant freshwater prawn (*Macrobrachium carcinus*) and the culture of the giant river-carp (*Probarbus jullieni*). These studies had been greatly assisted by an FAO Inland Fishery Expert. In fisheries technology, studies had been made on cold-room storage of salt-fish. Oceanography work covered a study of the salinity pattern on the North Malacca Strait, and was being extended to Langkawi Islands. A similar study on the East Coast was planned.

The programme was continuing for clearing mining pools and waste waters with endrin and restocking with *Puntius javanicus* and *Tilapia mossambica*. Indian carp, particularly *Catla*, was firmly established with the pond-culturists and in 1960, 80,000 Indian Carp fry, mainly *Catla* were imported and distributed to farmers.

The delegate for the Netherlands said that, in Netherlands New Guinea progress was being made in the distribution of fish fry. An inland fisheries station was founded for that purpose at Jabaso (Sentani) with *Tilapia mossambica*, *Osphronemus goramy*, *Gambusia affinis*, *Trichogaster pectoralis* and four varieties of *Cyprinus carpio*.

The progress of general developments in the urban centres had exerted a favourable influence on the fishing industry. Recently the possibility was opened for fishermen to obtain Government loans for the purchase of outboard motors and fishing gear. Fisheries were intensified with Government aid. A new fisheries station was established. The Government supplied equipment and provided information on the preservation of fish. Experiments were being carried out for the packing of fish and for preservation. The Government acted as intermediary for the disposal of salted and dried fish. Research on catching techniques was continuing.

Practical training was being given at the experimental stations to crews on small mechanized craft. Six graduates of Hollandia Junior Technical School were attending and a number of fishermen will attend boat building courses under the auspices of the South Pacific Commission.

The Delegate for Pakistan stated that he took this opportunity of welcoming brother delegates and observers from different countries of the region to Pakistan.

During the past four years efforts had been made to increase production of fish which had risen from 282.6 thousand metric tons in 1958 to 292.5 thousand metric tons in 1959. During these years special attention was given to the construction of a fish harbour at Karachi for the

designing of which he was thankful to FAO and also to the mechanization of fishing boats which was to a great extent done under the guidance of that organization. For the development of fisheries, Pakistan was indebted to the International Cooperation Administration of the United States of America who besides providing experts, had generously contributed towards the construction of the fish harbour at Karachi, a cold storage and ice plant at Chittagong and for the machinery and equipment for a similar installation at Pasni on the Mekran Coast.

The mechanization of the fishing fleet and the introduction of nylon twine were also due to a liberal allocation of dollars by I.C.A., so much so that more than 200 fishing launches and trawlers had been constructed and were now plying on the west coast and 12 on the east. More were under construction and in due course, Pakistan would have a sizeable fishing fleet.

The fishermen were being helped through their cooperative societies in the procurement of their requirements. The government had recently exempted all taxes and duties on all imported fishing equipment and material.

In inland fisheries the cultural practices had been intensified, the number of demonstration fish farms and fish nurseries were increasing and more and more derelict waters were being reclaimed for the production of fish.

The transport of fish specially in East Pakistan had been given priority. Some big and small fish carrier boats with insulated holds were under construction and more would be built when the first attempt attained success.

Private enterprise was keen to set up modern fish industries. There were three fish freezing plants at Karachi and one in East Pakistan. One canning plant was under operation at Karachi. Applications had been received for more plants and in due course there would be many fish processing plants at important landing centres on the coast.

The Pakistan Delegate thanked IPFC for the valuable guidance in the field of fisheries development and research. The advice given by

the Regional Officers had to a great extent been helpful in organizing the national programme.

The Philippine Delegate extended to the Government of Pakistan and its people and to all present the sincere greetings of the Filipino people and best wishes for the success of the 9th Indo-Pacific Fisheries Council Session. He also thanked the Government of Pakistan for the gracious invitation to attend this Session.

The fisheries industry of the Philippines continued to prosper and fish production still indicated an upward trend from 427 thousand metric tons in 1958, to an estimated 444 thousand tons in 1960. Fish consumption during the three corresponding years was 488 thousand tons, 479 thousand tons and 494 thousand tons, respectively. Increased production was due to an increased area of brackish water fishponds and increased number of fishing vessels and was achieved through legitimate fishing methods. In the past, there had been rampant and widespread use of explosives in catching fish; this has been greatly minimized through the coordinated efforts of the Bureau of Fisheries and the Philippine Navy.

The off-shore and deep-sea fisheries resources in areas surrounding the Philippines were, however, practically untapped and unfished. The lack of knowledge by the fishermen, the lack of resources for capital formation, the lack of entrepreneurial talent and the small size of the fishermen's boats kept them from venturing further into the sea.

Explorations of the biological resources of the fishing grounds were started in 1956 by a fishery biologist detailed by FAO under the ETAP, and counterpart workers who had been trained by him continue the extensive research work on the biology of important commercial species. The research work had continued smoothly and new facts had been brought to light. Of much value also in these research works was the technical know-how which members of the staff of the Bureau of Fisheries had learned through the generosity of several governmental and international organizations.

The Government was encouraging capital investment on larger vessels and training of personnel for handling modern gear and tackle. A 100-ton demonstration vessel was acquired from Japan, and was equipped with modern navigational instruments, refrigeration units and scientific instruments for biological and oceanographic research purposes. The practical training of fishermen, in trade theories, gear design, construction, operation and preservation was being guided by a Japanese FAO master-fisherman who had been assigned in the Philippines. It was expected that the 25 reparation vessels from Japan, with gross tonnages ranging from 75 to 100, will form the nucleus of the deep sea fishing fleet.

The lakes and rivers of the Philippines which support a considerable portion of the inland population were now being stocked with freshwater species. A limnological project was started sometime in the middle of 1958, to obtain scientific information to serve as a basis for the management of the freshwaters for the production of the maximum sustained yield of useful products. An FAO limnologist assisted by a German expert, who was detailed through co-operative arrangements between the Organization and German Government, laid the ground work, starting with the two largest lakes of the country.

Although government financial aid to the industry was not as yet adequate to facilitate the accomplishment of the necessary research extension and expansion of the scope of fisheries work, there were recent indications that more liberal aid to the industry was forthcoming and likewise a brighter outlook of the fishing industry.

The Delegate of Thailand expressed his great pleasure in having the opportunity to express sincere appreciation on behalf of the Government of Thailand to the Government of Pakistan, for the invitation to participate in the present session in Karachi.

The Thai National Economic Development Programme demanded an increase of the fisheries products to meet the demand of the increasing

population. The Marine Fisheries Programme had been planned and put into operation to approach this goal. Accordingly the establishment of a trawling fishery in the Gulf of Thailand to utilize fully the bottom resources, and the development of coastal fisheries in the Indian Ocean had been undertaken. During the last two years, both were fairly successful in increasing marine productions, but marketing problems had arisen due to underdeveloped transportation and handling facilities.

The oceanographic survey of the Gulf and South China Sea by the Naga Expedition, sponsored by ICA, would be terminated soon. This expedition had received encouraging results which will be useful for development of the marine fisheries. The Thai Government wished to continue this study and exploratory fishing on lines which would help to develop the marine fisheries both in the Gulf and Indian Ocean. *Rastrelliger* investigations were in progress and a tagging programme had been in operation since 1959. The first report was submitted to the session. On the other side, the inland fisheries were fairly well exploited and further improved.

So far many problems had been solved but many still remained and cooperation was needed from every country in this region. The Government would be very pleased and enthusiastic to enter any kind of cooperation.

The Delegate for the United Kingdom said that Her Majesty's Government wished to convey its gratitude to the Government of Pakistan for inviting the Indo-Pacific Fisheries Council to hold its 9th Session in Karachi. Her Majesty's Government had always been aware of the important role played by the fishing industry in S.E. Asia in solving the food problems in that area, and would continue to give its support to the Council for the valuable work it did both in its advisory capacity and through the interchange of ideas during its meetings.

Continued progress was reported in marine fisheries in Brunei, Borneo and Sarawak, both through the medium of mechanisation and by other means, whilst fresh water fish culture was playing a more and more important role in the three territories.

In Hong Kong, the Fisheries Research Unit was transferred from the University to the Co-operative Development and Fisheries Department, but its work continued unimpaired, and contributed much to the continual improvements in the fishing industry in that territory.

The Tropical Fish Culture Research Institute in Malacca was now well established and had already produced results of great interest and of important application. Success was so far ensured that plans has been made for its expansion.

The Delegate of the United States of America expressed anew his Government's sincere interest in the increased utilization of the food resources of the sea for the benefit of nations of the Indo-Pacific region, and of sympathetic regard of the work of the Indo-Pacific Fisheries Council toward this end. Mention was made of the program, now beginning, for the international study of the oceanography of the Indian Ocean which should provide an increase in the knowledge of that ocean and its resources. The Indo-Pacific Fisheries Council might consider taking cognizance of the results of the Indian Ocean oceanographic program for the benefit of the member nations.

Research programs, now in course in the Central Pacific, gave promise of identifying racial differences among tuna by immunological reactions. Complete or tentative identifications of the larvae of all tuna species of commercial importance had been attained. The problems attendant upon holding even the more delicate species of tuna in captivity had been solved and experimental facilities ashore to study their behavior had been constructed. Studies of the reactions of conditioned fish under a wide variety of experimental circumstances were planned with the ultimate goal of increasing the efficiency of the tuna fisheries. Through oceanographic studies a successful method of predicting the availability of skipjack tuna in the Hawaiian area had been developed.

The results of studies concerned with the utilization of juvenile *Tilapia* as live bait for tuna fishing and of the problems of their economic rearing had been sufficiently successful to justify

the construction of a large facility for the production of *Tilapia* as a bait fish by the State of Hawaii.

Many of the vessels of the California tuna fleet, fishing by the live-bait method, were being converted to fish by purse seine. The employment of the nylon purse seine and the power block had substantially increased the efficiency of purse seining for tuna and other fishes.

The Honolulu Biological Laboratory by arrangement with the Area or Laboratory Director, could provide some space for visiting fishery research workers.

Le Délégué du Vietnam déclare que en qualité de représentant du Gouvernement de la République du Vietnam et au nom de la délégation Vietnamiennne à la 9^e Session du Conseil Indo-Pacifique des Pêches, il a l'honneur et le plaisir d'exprimer ses remerciements au Gouvernement du Pakistan d'avoir permis et facilité la réunion du Conseil dans ce beau pays et d'adresser ses amicales salutations aux collègues délégués des autres pays ici présents.

Faisant partie du Conseil dès sa création et ayant participé à la plupart de ses sessions, le Vietnam a pu suivre avec satisfaction les travaux de cette Institution internationale, travaux dont la portée scientifique et utilitaire sur le développement de la Pêche dans le Région n'est plus à démontrer.

Aussi, il tient à saisir cette occasion pour renouveler sa confiance au Conseil Indo-Pacifique des Pêches dont les efforts tendent à coordonner les programmes de recherches et d'application sur la production, l'exploitation et l'utilisation rationnelle des ressource aquatiques, dans un esprit de franche coopération internationale.

Le Vietnam, de par sa situation géographique favorable, grâce à la richesse faunistique de ses eaux tant maritimes que continentales et à la fertilité de son sol, présente d'énormes possibilités en matière de pêches maritimes, de pêches continentales et de pisciculture. En dehors du riz qui est la base de l'alimentation, le poisson constitue en effet la principale source de protéines animales de sa population. Pour parer

aux besoins sans-cesse croissants de la population il faut donc non seulement développer l'agriculture mais encore augmenter la production de pêche. Depuis sa création en 1957, la Direction des pêches a mis sur pied un programme national de développement de la Pêche et de la Pisciculture et a pu réaliser des progrès qui méritent d'être mentionnés dans différents secteurs.

La motorisation des barques de pêche a fait augmenter de façon notable la production. Les produits de la pêche arrivent à terre plus frais et en meilleures conditions. Jusqu'à ce jour, plus de 2500 barques ont été équipées de moteur diesel de 3,5 à 60 c.v.

L'adoption des fibres synthétiques dans la fabrication de filets de pêche contribue également à l'accroissement de la production.

Une autre source d'apport de protéines animales provient de l'extension de la Pisciculture d'eau douce et d'eau saumâtre. Un centre d'alevinage à grande production est créé dans la Région des Hauts Plateaux pour satisfaire aux besoins en espèces piscicoles des centres de développement agricoles et des agrovilles.

La construction des nouveaux ports de pêche dotés d'installation modernes (débarcadères, halles aux poissons, chambres frigorifiques etc...) facilite l'organisation du fish-marketing. Les coopératives de pêche ont pu acheminer directement leurs produits des lieux de production aux centres de consommation; ceci permet d'équilibrer le marché intérieur et d'envisager l'extension des possibilités d'exportation à l'étranger.

Des recherches sur la technologie alimentaire et leur application dans la pratique permettent d'utiliser rationnellement les produits de capture et de développer l'industrie de la conservation des produits de pêche.

En bref, bien qu'il reste encore beaucoup à faire pour mener à bien le programme de développement de la pêche au Vietnam il a pensé pouvoir y parvenir dans un proche avenir et ce, grâce aux efforts de son Gouvernement et à la collaboration des nations amies, dont la plupart sont aujourd'hui, présentes à cette 9^e session du Conseil Indo-Pacifique des Pêches.

The observer from Portugal considered it to be a great privilege to be present at the Ninth Session of the Indo-Pacific Fisheries Council. His country extended its best wishes and thanks to the Council and the Government of Pakistan for the generous invitation to participate as Observer. Portugal had two major fisheries interests in the Indo-Pacific area; Mozambique and Portuguese India. Mozambique was a province of Portugal which had an area of 770,000 sq. kms. and a population of 6,000,000 inhabitants. The diet of the people was deficient in animal protein, and this was one of the problems that they wished to resolve by increasing its production.

Anticipating the need for greater supplies of these proteins, the Government had intensified fish breeding in dams and ponds utilizing especially *Tilapia mossambica* and *Tilapia melanopleura*.

Sisal, tea and tobacco companies were also engaged in culture of fish to feed the hundreds of workers which they employed.

In order to study the fish fauna and to enable the annual stocking and transport to rivers or lakes, fisheries stations were being established throughout the entire province.

With respect to sea fisheries there was no established industry, but individual activity—mainly represented by native fishermen in the mouths of the principal rivers and at some points along the coast. Asiatic villages had been established constituting fishing communities whose sole fishing equipment consisted of gill nets, shore nets and stakes.

There were also colonies of well-trained European fishermen from Metropolitan Portugal who fished with lines, away from the coast using motor boats and utilizing refrigerating equipment to store fish ashore.

In Portuguese India there were native fishermen and industrial fisheries. Both were recognized by the government in that they were given subsidies at the beginning of each year to help them to buy fishing gear. The catch of the native fishermen was destined for the salting and drying industry. They were assisted by Techni-

cal Officers of the Department Mission de Biologie Maritime de Ultramar. The industrial fishing was carried on with motor boats and during only some months of the year did they use trawling vessels.

The catch was destined for local consumption and also for salting and drying as well as for the fish-meal industry. Within a few months an ice plant and one modern frozen fish system using air blast (-40°C) would be built with the cold storage at -20°C . and -30°C . The respective technical and economic studies had already been initiated.

The Observer on behalf of the General Fisheries Council for the Mediterranean welcomed the opportunity to attend the 9th Session of its sister and senior organization, the Indo-Pacific Fisheries Council.

He said it was a privilege to participate in the Session itself and assured the Council, that the GFCM would continue the exchange of information which had proved so beneficial in the past.

On behalf of the Pacific Science Association, the Observer thanked the IPFC for the invitation to attend its 9th Session. The interest of the Association in the fisheries of the Indo-Pacific Fisheries Region was well known, and in wishing the Council success in the present and future meetings, he drew the attention of the Council to the forthcoming 10th Pacific Science Congress, to be held in Honolulu, Hawaii from August 21 to September 6, 1961. Many topics of interest to the Council were to be discussed at the Congress and detailed information could be obtained from the IPFC Secretariat during this present Session or by applying in writing to the Secretary of the Pacific Science Association, Miss Brenda Bishop of Bernice P. Bishop Museum, Honolulu, Hawaii.

The Observer for the Pan Indian Ocean Science Association said it was a great pleasure and privilege for him to place before the 9th Session of the Indo-Pacific Fisheries Council at Karachi, on behalf of the Pan Indian Ocean Science Association, its sincerest felicitations

and good wishes for the success of the session, and to thank the Council for the kind invitation extended to PIOA to send an Observer to be associated with its deliberations. The 4th Congress of the Association met at Karachi in November 1960 and deliberated on many problems of interest to the countries around the Indian Ocean. Food was the subject in which all the countries of the region felt greatly concerned, particularly in view of their fast growing populations.

Besides cereals, meat and fruit produced on land, the fish resources of the seas and inland waters were of immense importance. The necessity for developing these resources in increasingly larger measure should receive careful consideration of this region, and the Indian Ocean countries would, therefore, be just as interested as those of the Pacific region. The findings and decisions of IPFC were in consequence of great importance to PIOA, and its close cooperation with the Council was felt both desirable and necessary. The Pan Indian Ocean Science Association also had many problems of common interest with the IPFC, and some coordinated plans might be worked out for national and regional implementation, through the joint deliberations of these organizations, when a suitable opportunity should present itself.

Protein deficiency in the diet of the Indian Ocean countries appeared to be one of the most important factors responsible for the malnutrition of their populations. Scientific investigations in this problem were being carried out in this region, and measures to overcome the deficiency by the supply of fish protein in much larger quantity were under consideration. Researches on the development of fisheries, constitute a major factor in any rational planning for the development of the food resources of this region. In that context, IPFC deliberations on the many and varied problems in this field were of vital interest.

The Observer on behalf of the South Pacific Commission stated:

“La Commission du Pacifique Sud profite de l'ouverture de la 9^{ème} session du Conseil

Indo-Pacifique des Pêches pour renouveler aux délégués des pays membres sa confiance dans l'utilité et l'importance des travaux qu'ils vont entreprendre. En effet, la coopération entre les nations dans les domaines scientifique et technique est une des formes plus aptes à assurer une meilleure connaissance entre les peuples et un développement harmonieux des pays les moins fortunés. Par ailleurs, les réunions d'organisations telles que le Conseil Indo-Pacifique des Pêches ou la Commission du Pacifique Sud sont les meilleurs moyens de confronter avec profit des thèses nationales qu'il devient possible d'amender dans l'amitié et la confiance réciproques. Dans de telles conditions, la Commission du Pacifique Sud souhaite que les délégués des pays membres du Conseil Indo-Pacifique des Pêches continuent à progresser dans leurs travaux; la voie ainsi choisie est certainement l'une plus profitable pour tous.”

The Observer on behalf of PAAS informed the Council that there were six Universities in Pakistan. Out of these 4 were located in West Pakistan, at Peshawar, Lahore, Hyderabad and Karachi. The other two were located in East Pakistan, at Dacca and Rajshahi.

There was a growing keenness on the part of many people to study aquatic biology viz. fauna and flora of different rivers, lakes and seas. In a number of the Universities, especially at Karachi, Lahore, Hyderabad and Dacca, special training was imparted to the students to enable them to study the aquatic animals. Special post-graduate school of Marine Zoology had been started by the University of Karachi in 1959. A post-graduate school of inland fisheries was also working at Hyderabad in the Sind University.

Nearly all the Universities of Pakistan had important and extensive water sources adjacent to them in order to give practical training to their students. The University of Peshawar was located, very near the high mountain streams, close to the big rivers Indus and Kabul and at a short distance from Warsak Canal system. The University of Lahore was located at the bank of Ravi river and in the meshes of the largest canal system in the world. The University of Sind

was hardly a few miles from the Indus and almost on the G.M. Barrage at Kotri-Hyderabad. The University of Karachi was not only located on the coast of the Arabian Sea but was hardly fifty miles from a chain of fresh water lakes of Thatta District and almost on the left bank of the estuary of Indus.

Universities of East Pakistan have an extremely large number of fresh water lotic as well as lentic environments available to them. None was very far from the sea.

The desire of these Universities, specially of their biology departments, had been made known to the public and the Government on several occasions and in various ways. Several of the teachers had received advanced foreign training in teaching and research in the field of marine as well as fresh water biology. Research work of practical and economic importance had been undertaken at Karachi, Lahore and Hyderabad.

The growing emphasis on development of fisheries in all parts of Pakistan and extreme and urgent need of tapping up and exploiting all water resources of the country including canals, rivers, lakes and the sea called for an immediate encouragement and provision of facilities for the study of marine and fresh water biology in the Universities.

The reorganisation of courses of studies following the report of the National Education Commission had marked the introduction of new and modern advancement in the field of marine biology, limnology, ecology and systematic studies of animals and plants of fresh water and the sea. The moment was therefore ripe and opportune for organising the studies in those Universities where teachers and post-graduate students had visible and tangible talent, training and experience of such studies.

A system of coordination of specialised studies in different fields of water biology could easily be evolved by the Universities themselves in order to avoid duplication. But a basic training in fresh water as well as in marine biology was fundamental to the instruction of students in

Zoology, Botany and Ecology. Such a training was not only required for producing good zoologists, botanists or ecologists, but was also a prerequisite to any programme of developing inland and marine fisheries in East and West Pakistan.

The financial implications of organising such studies are not embarrassing since they were not as great as for physical sciences. Every University should have obviously an aquarium with necessary fittings including cold running water supply. Small fishing gear and collection equipment could easily and cheaply be produced. Rearing of immature forms could be undertaken in rooms or chambers with controlled temperatures. A regional survey of water plants and animals could be organised if transport were made available to teachers and students at a very low cost and to the great benefit of the country. A few fellowships and studentships in a well directed programme would attract a number of talented young men to promote such a useful science in the country.

Council Delegates Honoured

The Council heartily congratulated Mr. Soong Min Kong, Delegate, and Mr. Abdul Halim bin Abdul Yasmin, Alternate of the Malayan Delegation on the high civil awards conferred upon them on the occasion of the installation on 4th January, 1961 of His Majesty the Yang di-Pertuan Agong III of the Federation of Malaya.

9th Session Arrangements

Through the courtesy of the Government of Pakistan, an invitation was received for the Council to hold its 9th Session in Karachi.

Negotiations were, however, somewhat protracted and the Executive Committee was unable to follow the Council's instructions that the Session should be held during the final quarter of 1960.

After consultation with the Government of Pakistan, it was decided to hold the Session during the period of 6-23 January 1961 and Member Governments were circularized accordingly.

A majority of Member Governments approved these arrangements and invitations to

the 9th Session were issued by the Secretariat, IPFC/Circ. 60/17 of 1 October 1960.

Invitations to be represented by Observers were sent to the non-Member Governments of: New Zealand, Nepal, Laos, Portugal, Norway, Canada and Iran, as well as to the following Observer Organizations:

United Nations Organizations
 United Nations Education, Scientific and Cultural Organization
 South Pacific Commission
 Pacific Science Council Secretariat
 Conseil Permanent International pour l'Exploration de la Mer
 Colombo Plan
 General Fisheries Council for the Mediterranean
 International Whaling Commission
 World Meteorological Organization
 Pan Indian Ocean Science Association
 Food and Agriculture Organization
 International Rice Commission
 International Labour Office
 Office de la Recherche Scientifique et Technique Outre Mer.

The following Observer Countries and Organizations expressed regret at being unable to be represented at the 9th Session:

Governments: Burma
 Cambodia
 Iran
 Laos
 New Zealand
 Norway

Organizations: Colombo Plan
 International Labour Office
 United Nations Education, Scientific and Cultural Organization
 World Meteorological Organization

Conseil Permanent International pour l'Exploration de la Mer
 UN ECAFE

Steering Committee

The Steering Committee, constituted to guide the conduct of the Session consisted of:

Chairman of the Council: M. Tran Van Tri
 Vice-Chairman : Mr. D.T.E.A de Fonseka
 Member of Executive Committee : Mr. Soong Min Kong
 Chairman of Technical Committee I : Dr. G. Prowse
 Chairman of Technical Committee II : Mr. S.A. Jaleel
 Chairman of Organising Committee : Dr. M.R. Qureshi
 Secretary of the Council : Mr. J.A. Tubb

Report on Credentials

In accordance with Section III of the Rules of Procedure, a report on the Credentials submitted by Delegates and Observers at the Ninth Session of the Council was presented and adopted. Officially accredited representatives of Member Governments participating at the Session were those of Australia, Ceylon, France, India, Indonesia, Japan, Korea, Federation of Malaya, Netherlands, Pakistan, Philippines, Thailand, United Kingdom, United States of America, and Vietnam.

Non-Member Governments, represented by Observers, were Canada and Portugal. Accredited Observers were present on behalf of the following organisations:

Food and Agriculture Organisation
 General Fisheries Council for the Mediterranean
 Pacific Science Association
 Pakistan Association for the Advancement of Science
 Pakistan Council for Scientific and Industrial Research

Pan-Indian Ocean Science Association
South Pacific Commission
United Nations Organisation.

Report of the Executive Committee

The Council considered the Report of the Executive Committee in the light of recommendations and comments made in the submission of the Council from the Special ad-hoc Sub-Committee consisting of:

Dr. M.R. Qureshi (Pakistan)
Mr. Soong Min Kong (Malaya) and
Mr. J. Montilla (Philippines)

was appointed by the Chairman to examine the Report.

The Council adopted the Executive Committee's Report upon the recommendation of Sub-Committees and drew attention to the valuable information contained in the report presented by Observers on behalf of the Council at International Meetings.

Executive Committee Meetings

The 29th Meeting of the Executive Committee was held in Hong Kong from 5-8 October 1959 and was attended by:

Chairman: Mr. Tran Van Tri
Vice-Chairman: Mr. D.T.E.A. de Fonseca
Member: Mr. Soong Min Kong
(Chairman, IPFC Tech. Com. I, co-opted)

An apology for non-attendance was received from the ExCo Member, Dr. K. Kuronuma.

The 30th Meeting of the Executive Committee was held in Phnom Penh, Cambodia, from 13-16 July 1960 and was attended by:

Chairman: Mr. Tran Van Tri
Member: Dr. K. Kuronuma

Mr. D.T.E.A. de Fonseca, Vice-Chairman, sent an apology that at the last minute he was unable to arrange to attend this meeting.

It was not possible, owing to short notice, to co-opt either of the Chairmen of Technical Committee I or Technical Committee II.

The 31st Meeting of the Executive Committee was convened on 5th January 1961 in Karachi immediately preceding the opening of the 9th IPFC Session and was attended by:

Chairman: Mr. Tran Van Tri
Vice-Chairman: Mr. D.T.E.A. de Fonseca
Member: Mr. Soong Min Kong
(Chairman, Tech. Com. I, co-opted in the absence of Dr. Kuronuma)

The Secretary, Mr. J.A. Tubb attended the three above meetings.

Travel

In addition to attending the above meetings, the Secretary visited countries in the region as follows:

Vietnam—Saigon, January 1959 (UNESCO Regional Meeting on Marine Science)
Federation of Malaya, Singapore, Hong Kong, Sarawak, North Borneo, Brunei, Philippines, Vietnam, Cambodia—March-May 1959
Cambodia—Phnom Penh, June 1959 (FAO/ICA Seminar on Fisheries)
Cambodia—Phnom Penh, September 1959
India, Burma, Pakistan—October 1959
Italy—Rome (10th FAO Conference)
East Pakistan—February-March 1960
Malaya, Brunei, North Borneo, Vietnam (FAO Regional Conference, Saigon)—November-December 1960.

Dr. G.N. Subba Rao, Technical Secretary, Technical Committee II, visited countries in the region as follows:

Indonesia—May 1959
Japan, Korea, Hong Kong, May-June 1960
Vietnam, Philippines—August-September 1960
Federation of Malaya, Singapore—November 1960.

IPFC Staff

Mr. J.A. Tubb, Regional Fisheries Officer, continued as Secretary for the Council

Mr. Wm. A. Dill, Chief Inland Resources Section, Fisheries Biology Branch, Fisheries Division, served as Technical Secretary, Technical Committee I

Dr. G.N. Subba Rao, Asst. Regional Fisheries Officer, served as Technical Secretary, Technical Committee II, assisted by

Mr. Y. Miyake, Fisheries Economist, as Technical Secretary of Panel C, Technical Committee II.

The Chairman, Mr. Tran Van Tri was invited to contribute a paper on the "Indo-Pacific Fisheries Council and its Role in Oceanography" for the UNESCO Conference on Research in Marine Sciences held in Copenhagen, July 1960.

The Secretary represented the Council at the UNESCO Regional Meeting of Specialists in Marine Science in January 1959 in Saigon, at the ECAFE/WMO Inter-regional Seminar on Hydrologic Networks and Methods in Bangkok, July 1959 and at the UNESCO Symposium on Algae, New Delhi, December 1959.

Dr. G.N. Subba Rao represented the Council at the 5th Session of the Inland Waterways Sub-Committee, ECAFE, Bangkok, 1959 and Dr. S.S. De, Regional Nutrition Officer acted as Observer on behalf of the Council at the ECAFE Working Party on Small Scale Industries and Handicraft Marketing, 6th Session, held in Bangkok, March 1960.

Mr. I. Petersen, Member of Technical Committee II, Panel B, acted as Observer on behalf of the Council at the FAO/ILO Technical Meeting in Fisheries Cooperatives held in Naples, May 1959.

Mr. Vernon E. Brock, IPFC Administrative Correspondent for USA acted as Observer on behalf of the Council at the International Oceanographic Congress organized by the American Society for the Advancement of Science in New York, September 1959.

Through the courtesy of Dr. D.B. Finn, Director, Fisheries Division, FAO Rome, the following officers acted as Observers on behalf of the Council:

Mr. T. Laevastu—at the ICES 47th Statutory Meeting, Copenhagen, October 1957.

Mr. H. Rosa—at the FAO World Scientific Meeting on the Biology of Sardines and Related Species, Rome, September 1959; and at the 6th Meeting of the G.F.C.M., Rome, September 1960.

Mr. S.J. Holt—at the ICES / ICNAF / FAO Experts Meeting on Fishery Statistics, Hamburg, September 1959; and at the ICES 48th Statutory Meeting, Moscow, September 1960.

Communication had been maintained with the I.A.P.O. Committee on General Bathymetric Chart of the Ocean and the report of the meeting of this Committee, Monte Carlo, March 1959, was transmitted to Member Governments. (IPFC/Circ. 59/11, 25 May 1959).

The Secretary had also received documents relating to the Second Conference on the Law of the Sea held in Geneva, March-April 1960.

Liaison had been developed, with the European Inland Fisheries Advisory Commission which held its first meeting in Dublin, April 1960.

The Council considered that the strength of the existing FAO Regional Fisheries staff stationed at Bangkok is inadequate for the needs of the Region which occupies a great portion of the world's area and is inhabited by about half the world's population. The Council noting that a Biologist and a Fisheries Food Technologist are already stationed in the Region, asked FAO to strengthen its Regional Office at Bangkok with the addition of a Craft and Gear Technician and a Fisheries Economist-cum-Marketing Officer. The Council noted that its request for the appointment of a Craft Technician in the Region at its 8th Session had not been implemented and asked FAO to give the highest priority to these posts and appoint these officers during 1961. If, however, the budgetary position does not permit this, the Council urged the Member Governments to take up the matter at the next FAO Conference.

Council's Report to F.A.O.

Following the decision of the 8th Session of the Council held in Colombo, and in accordance with the provision of Article 3 (i) of the Council's Agreement, the Executive Committee transmitted to the Director-General, FAO, a Report consisting of a resume of the Proceedings of the Council, based on the Summary of the 8th Session.

Publications and Bibliographies

a. IPFC Proceedings

The Proceedings of the 8th Session of IPFC held in Colombo were printed and distributed. These were issued in 3 separate Sections containing respectively the official Proceedings of the Session together with the Reports of the Technical Committee I and II as Section I; the technical papers approved for publication by the Technical Committees as Section II and the Symposium on Fish Behaviour as Section III.

b. Current Affairs Bulletin

Six issues of Current Affairs Bulletin, Nos. 24-29 were printed and distributed. Nos. 24-26 were printed during 1959 and Nos. 27-29 during 1960.

c. Special Publications

No Special Publications were issued by IPFC during the biennium.

d. Reference Books

The Manual of Field Method in Fisheries Biology which was examined in draft at the 8th Session was issued in a provisional printed edition by Fisheries Division, FAO Rome. Distribution was effected in July 1960.

e. Occasional Papers

The Occasional Paper series was continued, 12 papers being issued during 1959 and 5 papers during 1960. (See Appendix II).

Owing to an increasing demand for these Occasional Papers, the possibility of reproducing all or at least the more important Occasional Papers in printed or multilith form was being examined.

In this connection the Secretariat proposed that future issues of Occasional Papers from 1961 onwards should be in quarto size rather than the foolscap size used at present.

F. Bibliographies

In connection with the development of the country and regional thesaurus system instituted by Fisheries Division, Rome, the Secretariat had been engaged in preparing synopses of fisheries of certain countries in the region.

An important part of this work was the compilation of accurate bibliographies on a country basis and every attempt was being made to bring these bibliographies up-to-date. Bibliographies were in draft for Burma, Ceylon and Pakistan.

Facilities permitting, these bibliographies would be included in the Occasional Paper series during the forthcoming biennium.

Financial and Budget Report

In accordance with the instructions given by the Council at the Colombo Session, a financial and budget statement was distributed to Member Governments as Appendix to the official invitation to attend the current Session of the Council.

The Council considered that the budgetary provision for its operation was inadequate and decided to request FAO to provide at least the amount indicated in the Estimates of Expenditure for 1961 and for the biennium 1962-63.

IPFC STATEMENT OF EXPENDITURE FOR 1959

	Expenditure US \$	Budget Allocation US \$
A. EXECUTIVE COMMITTEE TRAVEL	879.70	1,500.00
29th Executive Committee Meeting, October 5-8, Hong Kong		
Chairman: Mr. Tran Van Tri (Vietnam)		
Fare	201.30	
Subsistence } Terminal }	130.50	
Vice-Chairman: Mr. D.T.E.A. de Fonseka ⁽¹⁾ (Ceylon)		
Subsistence } Terminal }	115.00	
Chairman, Technical Committee I: Mr. Soong Min Kong (Malaya) ⁽²⁾		
Fare	302.40	
Subsistence } Terminal }	130.50	
B. PRINTING		
1958 Budget (Payment made in 1959 from balance funds in 1958 budget carried over)	1,262.64	1,262.64
Packing and freight charges from Madras to Bangkok on stock copies (after distribution) of IPFC		
6th Proceedings	39.86	
600 copies C.A.B. No. 23	126.49	
Printing 1,300 copies, IPFC		
7th Proceedings, Sections II & III	1,096.29	
1959 Budget	2,000.00	2,000.00
Postage charges on distribution of approximately 1,000 copies of IPFC 7th Proceedings, Sections II & III	210.94	
600 copies C.A.B. No. 24	109.52	
650 copies C.A.B. No. 25	132.09	
Printing 1,400 copies, IPFC		
7th Proceedings, Section I	801.91	
Postage charges on distribution of approximately 1,000 copies of IPFC 7th Proceedings, Section I	122.22	
650 copies C.A.B. No. 26	126.09	
Printing 1,300 copies, IPFC		
8th Proceedings, Section I (part)	497.23	

	Expenditure US \$	Budget Allocation US \$
C. MEETING		
(No Council Session in 1959, therefore no expenditure incurred)		
D. MISCELLANEOUS	1,169.07	1,169.07 (4)
Postage & Telegrams	545.11	
Book binding 110 vols. (3)	104.76	
Air Freight	26.94	
Stationery	488.34	
Expenditure made on behalf of IPFC by FAO Office, New Delhi 18.64 Ind. Rups.	3.92	

Notes: (1) In respect of Mr. D.T.E.A. de Fonseka no travel fare was necessary since he took this trip in conjunction with other travel on business for his Government, thus saving fare expenses for the IPFC.

(2) In view of the fact that Dr. K. Kuronuma (Japan), retired Chairman of the Council, and now member of the present Executive Committee, was unable to be present due to ill health, by the Rules of Procedure,

Mr. Soong Min Kong (Malaya) and currently Chairman of IPFC Technical Committee I, was co-opted.

(3) Under this heading there was a separate expenditure of US\$ 400 which FAO authorized, separately out of Division HQ funds, for binding of additional 400 vols. of literature for the IPFC Library.

(4) An amount of US\$169.07 over the Budget Request from US\$1,000 was made available from Fisheries Division funds.

IPFC STATEMENT OF EXPENDITURE TO 30 DECEMBER 1960

	Expenditure US \$	Budget Request US \$
A. EXECUTIVE COMMITTEE TRAVEL	432.00	2,000.00
30th Executive Committee Meeting, Phnom Penh, Cambodia, July 1960		
Chairman: Mr. Tran Van Tri (Vietnam)		
Fare	40.00	
Subsistence } Terminal }	176.00	
Member: Dr. K. Kuronuma (Japan)		
Fare	40.00	
Subsistence } Terminal }	176.00	

Note: Vice-Chairman: Mr. D.T.E.A. de Fonseka (Ceylon) did not attend.

	Expenditure US \$	Budget Request US \$
B. PRINTING	2,020.00 (est.)	2,100.00
650 copies C.A.B. No. 27	97.14	
650 " " No. 28	130.86	
1,300 copies IPFC Proceedings, 8th Session, Section I balance payment	396.10	
1,300 copies IPFC Proceedings, 8th Session, Section II	580.71	
1,300 copies IPFC Proceedings, 8th Session, Section III	687.62	
650 copies C.A.B. No. 29	120.00 (est.)	
C. MEETING		
9th IPFC Session	150.00 (est.)	150.00
D. MISCELLANEOUS	1,500.00	1,500.00
Postage: \$ 865.23 (end Nov.)		
Stationery and Office supplies: \$ 500.96 (end Nov.)		
Expenditure at FAO Delhi Office—32.02 Ind. Rups. on behalf of IPFC		
(Estimated expenditure—Dec. 1960 \$ 133.81)		

IPFC BUDGET ALLOCATIONS

(Based on FAO Financial Biennium)

I 1958 - 1959

Item	Requested	Allocated
A. Executive Committee Travel	3,000	2,700
B. Printing	4,000	4,000
C. Meeting	2,700	760 (+)
D. Miscellaneous	<u>2,000</u>	<u>2,000</u>
Total	<u>11,700</u>	<u>9,460 (+)</u>

II 1960 - 1961

Item	Requested	Allocated (1960)
A. Executive Committee Travel	3,500	378
B. Printing	6,000	2,100
C. Meeting	2,700	—
D. Miscellaneous	<u>1,500</u>	<u>1,000</u>
Total	<u>13,700</u>	<u>3,478</u>

Notes

For the period 1958-59 actual expenditure and allocation remained within the budget as requested.

In respect of Item C.—Meeting, it will be noted that a request for US\$2,700 was made whereas the Secretariat's accounts show the expenditure totalling US\$760.

At the IPFC meeting held in Colombo 1958, simultaneous French-English interpretation services were provided by FAO but the actual cost of these was met from FAO Headquarters and the detail of expenditure under this heading has not been made available to the IPFC Secretariat.

For the period 1960-61, the right-hand column indicates the amount actually allocated in respect of the year 1960, the left-hand column showing the total amount requested at the IPFC Session, Colombo, and including estimated expenditure during 1961.

Under Item A.—Executive Committee Travel, only one meeting of the ExCo was held in 1960 and due to the fact that the Vice-Chairman was unable to attend, expenditure under this heading was very low.

Under Item B.—Printing, expenditure during 1960 included the publication of the Proceedings of the 8th Session held in Colombo together with 3 issues of the IPFC Current Affairs Bulletin.

Under Item C. — Meeting, no Council meeting was held during 1960.

Under Item D. — Miscellaneous, expenses involved were somewhat higher than anticipated, as will be seen from the estimates quoted in Annex II.

Expenditure on postage for the distribution of IPFC Proceedings and C.A.B. together with 5 separate Occasional Papers was considerably in excess of that originally anticipated.

IPFC BUDGET ESTIMATED EXPENDITURE 1961

A. EXECUTIVE COMMITTEE TRAVEL		\$ 1,500
31st ExCo Meeting, per diem only	\$ 50	
32nd " " "	50	
33rd " fares & per diem	1,400	
B. PRINTING		2,700
9th Session Proceedings	\$ 2,200	
C.A.B. 3 issues	350	
Occasional Papers	150	
C. MEETING		600
(Excluding interpretation services)		
D. MISCELLANEOUS		1,500
Postage & Telegrams	\$ 850	
Stationery	500	
Incidental	150	
	Est. Total	<u>\$ 6,300</u>

Notes

It has been considered desirable to re-adjust the IPFC budget requests and expenditure statements to conform with the recently instituted Financial Biennium of the Food and Agriculture Organization.

Accordingly an estimate of expenditure to cover the period 1961 is submitted separately.

In respect of Item A.—Executive Committee Travel, three meetings of the Executive Committee will be held during the year but for the meetings Nos. 31 and 32, expenditure will be restricted to the payment of per diem only, since they will be held in conjunction with the 9th Session of the Council, Karachi, January 1961.

The 33rd meeting of the Committee scheduled for 1961 will involve payment of per diem and fares for the Chairman, Vice-Chairman and Committee Member.

Under Item B.—Printing, the backlog of printing has now been overcome and the publication of the 8th Session Proceedings will be completed prior to the 9th Session, hence it will be possible to put in hand publication of the 9th Session Proceedings during the first quarter of 1961.

Current Affairs Bulletin will, as usual, be 3 issues during the year.

Provision is also made for the printing or multilithing of IPFC Occasional Papers for which the demand is now steadily increasing and it is considered that the current system of mimeographing these documents is no longer satisfactory.

Under Item C.—Meeting, incidental expenditure in connection with the 9th Session will be of the order US \$600 covering costs of freight on bulky documents, overtime payable to local staff.

IPFC PROPOSED BUDGET 1962 - 1963

Item				Amount
A. EXECUTIVE COMMITTEE TRAVEL				\$ 2,900
1962	34th Executive Committee Meeting.			\$ 1,400
	35th	„	„	50
	36th	„	„	50
1963	37th	„	„	1,400
(Per diem only payable)				
B. PRINTING				
1962	3 issues C.A.B.			\$ 350
	Occasional Papers			250
1963	Proceedings 10th Session			2,300
	3 issues C.A.B.			350
	Occasional Papers			250
C. MEETING 1962 (last quarter)				750
(Excluding interpretation services)				
D. MISCELLANEOUS				3,000
1962	Postage, Stationery etc.			\$ 1,250
1963	„	„	„	1,750
(incl. distrib. 10th Procs.)				
Total				<u>\$ 10,150</u>

Notes

This proposed budget is designed to cover the FAO Financial Biennium 1962-63.

Under Item A.—Executive Committee Travel, the Executive Committee meetings Nos. 35 and 36 will be held in conjunction with the 10th Session of the Council and for these, per diem only is payable.

Full Executive Committee meetings Nos. 34 and 37 are expected to be convened respec-

tively in 1962 and 1963 and for these, per diem and fares are payable.

Under Items B.—Printing provision is made in 1962 for the publication of 3 issues of the C.A.B. together with printing or multilithing of Occasional Papers.

During 1963 it will be necessary to print the Proceedings of the 10th Session which it is anticipated will be held during the final quarter of 1962. Also in 1963, three issues of the C.A.B.

and an unprinted number of Occasional Papers will be issued.

Item C.— Meeting, provision is made for the meeting to be held in the last quarter of 1962 which will involve incidental expenses in respect of overtime to local staff, postage and freight of bulky documents. No provision is made for English-French interpretation.

English-French Interpretation

Following a strong protest raised by the French speaking delegations which is recorded in the minutes of the First Plenary Meeting, against the absence of interpretation services, the Council noted that it had not been possible for budgetary reasons to provide these services.

The Council requested FAO to give further consideration to this matter and to do all in its power to ensure that future sessions are provided with appropriate facilities.

The French-speaking delegations assured the Council that they would, in the interests of the Council's work do their utmost to resolve their difficulties.

Amendments to the Agreement

With the consent of the Council, Netherlands Government's proposal for an amendment of the Council's Agreement as submitted during the 8th Session of the Council was withdrawn.

The U.S. Government's proposal for an Amendment of the Council's Agreement in conformity with the Resolution adopted at the 8th FAO Conference was introduced.

Following a statement by FAO Legal Counsel, concerning the status and implications of this proposed Amendment and in view of the fact that several delegations wished to propose modification of the Amendment as submitted, the Chairman appointed a Special Sub-Committee to examine the Amendment and proposed modifications and to report back to the Council's Plenary Session.

The Sub-Committee consisted of:

Chairman: Mr. D.T.E.A. de Fonseka

Members: Delegate of France
 Delegate of Indonesia
 Delegate of Netherlands

Delegate of Pakistan

Delegate of United States of America

FAO Legal Counsel

Several delegations submitted proposals for amendments and modifications of the text as originally presented. These proposals were considered by the Sub-Committee which incorporated the appropriate verbal modifications in a revised text (Appendix IV). Certain proposals were, however, of a substantial nature and the Sub-Committee recommended that, if desired, the proposals should be submitted by the Member Governments to the Secretary in accordance with Section XV of the 1955 version of the Rules of Procedure.

FAO Legal Counsel discussed in detail the proposals for amendment which the Sub-Committee had referred back to the proposers, pointing out that any action which might be taken at the present Session did not prevent Member Governments from submitting further proposals but, since these proposed amendments were substantial, the Rules of Procedure prevented them from being considered at the current session.

The Sub-Committee's Report was received by the Council. The Chairman ruled that, as the opportunity had been given for delegations to submit proposals for amendment or modification to the Special Sub-Committee, no further discussion on the text of the proposed Amendment could be permitted.

On being put to the vote, 14 votes in favour, and 1 abstention were recorded.

The required majority of two-thirds of the Governments Members of the Council having been obtained, the Amendments were adopted, the revised text of the Agreement and Rules of Procedure, are attached as Appendix IV.

The Secretary was instructed to refer other proposals for amendment of the Agreement and Rules of Procedure, as proposed in the Reports of the Amendments Sub-Committee, to Member Governments for consideration and reference to the 10th IPFC Session.

Publication of Council Proceedings

The Council instructed the Secretary to ensure the printing and distribution of the Proceedings of the Ninth Session as soon as possible.

The Council approved for publication in full in Section II of the Proceedings, Technical Paper Nos. 1, 5, 6, 8, 9, 10, 11, 12 (after revision), 13, 14, 15, 19, 20, 25, 26 (revised illustrations), 28, 33, 34, 36, 38 and Working Papers 29 and 42; Technical Papers Nos. 4, 7, 16, 30, 35, 37 to be published in full in Current Affairs Bulletin; Technical Papers Nos. 2, 3, 23, 24, 29 (after revision), 31, 32, 33, and Working Papers 20, 30, as Occasional Papers; and Working Paper 13 to be referred back to the author for redrafting as a Technical Paper for the 10th Session.

Council Correspondents

In accordance with the recommendations of the 8th Session Governments were not requested to nominate Bibliographic Correspondents.

Administrative Correspondents, as designated by Member Governments, are listed in Appendix II.

Nominations of Technical Committees

The nominations received from Member Governments in respect of Technical Committees I and II, their Panels and the special Sub-panels Committees were accepted by the Council (See Appendix II).

Chairmen of these bodies were elected and are indicated in Appendix II.

Intersession Meetings of Technical Committees

The Council reviewed the replies from Member Governments in response to the Secretariat Circular on the subject and noted the opinions expressed by delegations at the Session.

The consensus of opinion was in favour of such meetings provided the agenda was restricted to one subject.

The Technical Committees were instructed to keep this matter in view when preparing recommendations in their particular fields for the Council's programme for the ensuing intersession period.

Operation of Technical Committees

The Council recommended that Panel A, Inland Fisheries, Panel B, Sea Fisheries, and the Sub-Committees on *Rastrelliger*, *Chanos*, *Hilsa* and Fish Culture in Rice-Fields of Technical

Committee I, and Panel A, Craft and Gear, Panel B, Food Technology, Panel C, Socio-Economics and Statistics, and the Sub-Committee on Fish Marketing of Technical Committee II should continue to function.

The Council further recommended that at the 10th Session the work of the Panels and Sub-Committees be appraised in the light of progress achieved in the intersession period and that as necessary they be reconstituted or discontinued.

Technical Assistance

The Council reviewed the following proposals in this field:—

1. The 8th Session Recommendations for the establishment of a Special Fishery Survey Training Centre.
2. FAO Far East Regional Conference recommendations for:
 - (a) Regional Seminar on Fisheries Administration, to follow national seminars on this subject.
 - (b) Regional Seminar on Fish Marketing.
 - (c) The establishment of a permanent Food Technology Training Centre.
3. Proposals brought forward by the Technical Committees:
 - (a) Workshop on *Rastrelliger*.
 - (b) Training Centre for Fisheries Officers in Fishing Craft and Gear (Instructors and Exhibition workers).
 - (c) Training Centre or Seminar on Fisheries Administration.
 - (d) Training Centre or Seminar on Fish Marketing.
 - (e) Training Centre or Seminar on Fishery Credit.

The Council deleted from the list the proposal for a Fishery Survey Training Centre but decided that this subject should be reconsidered at the 10th Session. After discussion

the Council recommended that F.A.O. Fisheries Division be requested to explore the possibilities for establishing the Rastrelliger Workshop and the Training Centre for Fishery Officers in Fishing Craft and Gear as these were considered of more immediate significance. However, the possibility of establishing one or all of the three other proposed Centres should be examined, in the light of the availability of facilities and funds.

The Council noted with appreciation the intimation by the Delegate for Malaya that his Government would be willing to act as Host to the proposed Rastrelliger Workshop.

The Council wished it to be placed on record that it supported the Recommendation of the Fifth FAO Far East Regional Conference concerning the establishment of a permanent Food Technology Training Centre.

9th Session Symposium

The Symposium on 'How to formulate programmes of fisheries research and technological improvements, particularly in fish handling, required for the implementation of national policies for fisheries development and methods of assessing progress in these programmes' was held on:

Monday 16th January 1961 from 2030-2300 hours.

Tuesday 17th January 1961 from 1100-1230 hours.

Wednesday 18th January 1961 from 1030-1200 hours.

Mr. D.J. Gates, Convener was assisted by Mr. D.T.E.A. de Fonseka as Rapporteur.

The Symposium was arranged as follows:—

First Session:

1. The functions of fisheries administration.
2. The place of the fisheries agency in the Governmental structure;

Discussion leader: Mr. Soong Min Kong.

Papers: 2, 5, 6, 9, 13, 14, 17, 20, 23, 24.

Second Session:

The formulation of research projects for implementing a policy of fisheries development.

Discussion leader: Mr. V. Brock.

Papers: 2, 5, 6, 7, 8, 12, 13, 18, 22.

Third Session:

Technological and marketing problems concerning fisheries products in tropical areas.

Discussion leader: Mr. C. Martin.

Papers: 2, 3, 5, 8, 10, 12, 14, 19.

Fourth Session:

How to assess progress in fisheries development programmes.

Discussion leader: Dr. G.A. Prowse.

Papers: 2, 4, 5, 11, 14, 16, 19, 21, 22.

Fifth Session:

A general discussion to summarise the proceedings of the previous sessions. In this discussion it was proposed to:

1. Examine the criteria and procedures currently used in the selection of fisheries projects in the Indo-Pacific region.
2. To develop criteria for setting priorities in fishery development programmes.

The Convener, Mr. D.J. Gates presented a brief interim Report, which was adopted by the Council.

The Symposium papers and a review of the discussion are published as Section III of these proceedings.

The subject created much discussion and exchange of opinions. The success of the symposium was due to a large degree, to the number of people present who had contributed papers for discussion.

The consensus of opinion was that a fishery programme must be based on a number of common principles which are listed below:—

1. a national policy on definite objectives.
2. adequate authority to carry out the responsibility.
3. a delineation of problems.
4. adequate background data for programming.
5. adequate control of programming.
6. periodic review of operations.
7. periodic assessment of results.
8. co-ordination and consultation with other interested organisations at a national and international level.

In assessing progress in development programmes it was considered that an accurate judgement can be made in regard to the success of an exploratory fishing or gear research programme, the impact on industry is immediate. However, the assessment of progress in biological research is more difficult and in most cases it is only after several years of patient work that biological and oceanographical research pay dividends.

10th Session Symposium

The Council considered the two following subjects:

- (i) "The Training of Fisheries Personnel, including Fisheries Technologists, Research Workers and Administrators".
- (ii) "The Development of Mechanized Fishing Fleets in the Indo-Pacific Region".

Following discussion it was decided to select the second subject, deleting the phrase "in the Indo-Pacific Region".

Accordingly the subject designated for the 10th Session Symposium is:

"The Development of Mechanized Fishing Fleets."

The Council requested Mr. Lee Bong Nai, Director, Central Fisheries Experiment Station, Pusan, Korea to act as Convenor and requested FAO Fisheries Division to assign specialist staff to assist Mr. Lee.

Time and Place of 10th Session

Through the courtesy and generosity of the Government of Korea, the Council received an invitation to hold its 10th Session in Seoul, Korea. Subject to a final decision as a result of consultation between the Executive Committee and the Host Government, the time of the meeting was tentatively fixed at September-October, 1962.

Election of Office Bearers

Delegate for United Kingdom seconded by the Delegate for Pakistan proposed Mr. D.T.E.A. de Fonseka (Ceylon) as Chairman of the Council for the intersession period and the 10th Session. There being no other proposals the Council unanimously elected Mr. de Fonseka as Chairman.

The Delegate for Philippines seconded by the Delegate for Vietnam nominated Dr. M.R. Qureshi (Pakistan) as Vice-Chairman. There being no other nomination, Dr. Qureshi was unanimously elected Vice-Chairman.

Formal Resolutions

On the motion by the Delegate for Malaya the Council adopted a resolution as follows:

"That the Council records its grateful appreciation for the generous hospitality and excellent facilities which have been so graciously extended by the Government and the people of Pakistan to the Council and the Delegates for the Member Governments and to other participants attending the 9th Session and directs that this expression of appreciation be formally communicated to the Government".

On the motion by the Delegate for Korea the Council adopted a resolution as follows:

"That the Council express its most sincere thanks to the Minister for Food and Agriculture Lt.-Gen. K.M. Sheikh, who honoured Council by presenting the Inaugural Address and conveys to the Minister a expression of deep appreciation for the courtesy, hospitality and assistance rendered to the Council by the Ministry of Food and Agriculture and in particular the Director and Staff of the Central Fisheries Department".

The Delegate for Vietnam proposed and the Council adopted the following resolution:

"That the Council desires to place on record an expression of its deep appreciation for the excellent facilities provided and the arrangements made for holding the Council's 9th Session by the Pakistan Organising Committee and especially wishes to record its thanks to individual members of the Organising Committee and the associated staff of the Central Fisheries Department for the painstaking and tireless manner in which they have attended to the needs not only of the Council but also of the individual participants at the Session."

The Delegate for U.S.A. proposed and the Council adopted a hearty vote of thanks to Mr. Tran Van Tri for his excellent services as Chairman of the Council, for his close and

detailed attention to the affairs of the Council during the intersession period and for the skill and acumen with which he has conducted the business of the Council during its 9th Session.

La delegation de la Republique francaise a propose, et le Conseil a approuve, une resolution exprimant la satisfaction du Conseil devant l'interet profond et soutenu manifeste par le Directeur general de l'Organisation pour l'Alimentation et l'Agriculture a l'egard de ses activites et il tient a exprimer en particulier sa vive appreciation pour le concours actif et efficace de Mr. Saint-Pol, conseiller juridique de l'O.A.A.

Par ailleurs le Conseil desire attirer l'attention du Directeur-general en premier lieu sur le travail considerable accompli par l'equipe du Secretariat au cours de cette session caracterisee par une abondance de documents conjuguée à la carence inopportune du service d'interpretation et, plus generalement sur l'interet constant qu'apporte aux travaux du Conseil la Division des Pêches de l'Organisation pour l'Alimentation et l'Agriculture.

The Delegate for Australia proposed and the Council adopted a vote of appreciation for the services of the Council's Secretariat and for the manner in which it had carried out the instructions of the Council as well as for the servicing of the 9th Session.

Attention was drawn particularly to the most valuable and efficient services rendered during extremely long hours by Secretariat personnel assigned by the Central Fisheries Department to assist the Secretariat.

Following the adoption of the resolutions the Secretary was instructed to record them in the Proceedings of the 9th Session.

The Delegate for India on behalf of his Government expressed sincere appreciation to the Government of Pakistan, the Ministry for Food and Agriculture, the Central Fisheries Department and others concerned for the facilities provided and the arrangements made for the 9th Session of the Indo-Pacific Fisheries Council.

Close of the 9th Session

After an introductory speech by the Chairman, Mr. A.M. Salimullah, Joint Secretary, Ministry for Food and Agriculture briefly addressed the Council and formally declared the Ninth Session closed.

The outgoing Chairman, Mr. Tran Van Tri handed over the Chairman's gavel to the incoming Chairman.

The 9th Plenary Session of the Indo-Pacific Fisheries Council terminated at 1130 a.m. on Monday 23rd January, 1961.

CHAPTER II

RESOURCES

Part A

*Report on Inter-Sessional Activities (1959-60) of
Technical Committee I*

CONTENTS

	Page
0. INTRODUCTION	35
1. INFORMATIONAL SERVICES, BIBLIOGRAPHIES, REFERENCE BOOKS . . .	35
a. Bibliography and information—general	35
b. Reference Books	36
2. AQUATIC RESOURCE APPRAISAL	36
a. Tunas	36
b. Mackerels	39
c. Sardines	42
d. Chanos	44
e. Hilsa	45
f. Mugil	49
g. Shrimps	50
h. Pearl Molluscs	50
3. RESEARCH, INCLUDING DEVELOPMENT OF METHODOLOGY AND TECH- NIQUES, ON CERTAIN SPECIALIZED SUBJECTS RELATING TO FISHERIES	50
a. Standardization of plankton nets	50
b. Identification of fish and plankton	55
c. Population dynamics	58
d. Age determination	59
e. Fish behaviour	60
f. Oceanography	60
g. Study of basic productivity	65
h. Benthos ecology	66
i. Trawling studies	66
4. MANAGEMENT OF FISHERY RESOURCES IN NATURAL WATERS (Including Reservoirs)	67
a. River basin development	67
b. Water pollution control	68
5. FISH CULTURE AND FISH DISEASE CONTROL	71
a. Fish culture—general	71
b. Nutrition of fish under cultivation	72
c. Soil composition in fish ponds	72
d. Aquatic weed control	73
e. Non-indigenous fishes	73
f. Fish culture in rice fields	75
Annexes A-F	77

INTRODUCTION

The following reports action during the periods between the 8th and 9th Sessions, 1959-60, recorded by Member Countries of the Indo-Pacific Fisheries Council and by FAO with special reference to the Recommendations adopted by the Council during the 8th Session (Colombo, 1958).

The material has been compiled from reports submitted by: the members of IPFC Technical Committee I (Hydrology and Biology); its two Panels, A (Inland Fisheries) and B (Sea Fisheries); the special Sub-Committees; and the FAO Secretariat.

As originally presented, the report followed generally the order of topics as set forth in Chapter 6, "Recommendations" of Indo-Pacific Fisheries Council, Proceedings, 8th Session, Section I. However, the Committee was not satisfied with the grouping of subjects that was used, and, following the adoption by the Council of a new outline or organizational scheme for the presentation of its work programme, the Secretariat rearranged the contents of the Inter-sessional Report to fit in generally with the new outline. However, it was felt that it should not break too sharply with past procedure and has, therefore, retained most of the "old" sub-titles.

A key has been provided in order to link the individual topics with the formal Recommendations of the 8th Session. Thus, following each major subject title there appears, within parentheses, a set of letters and numbers which refer to the individual and pertinent recommendations as they are outlined in the aforementioned Proceedings.

It should be noted that the numbers preceded by:

- A—refer to recommendations addressed to Member Governments (pp. 115-118);
- B—recommendations to FAO (pp. 119-121);
- C—recommendations to the Executive Committee and Secretariat of IPFC (pp. 121-123).

1. INFORMATIONAL SERVICES, BIBLIOGRAPHIES, REFERENCE BOOKS

a. Bibliography and information—general (*Recommendations A - 1 (i), B - 6*)

The printed version of the Current Bibliography for Aquatic Sciences and Fisheries is now appearing regularly, after a long delay while new publication arrangements were being made. It is expected that by early in 1962 there will no longer be a backlog. The arrangement whereby Mr. Margetts, who used to prepare the "Current Bibliography" for ICES, now prepares for publication a subject index of the FAO Current Bibliography, is working very smoothly. Mr. Margetts also prepared, by contract with FAO, subject indexes to the first mimeographed, volumes of the FAO bibliography, and these together with taxonomic, author, geographic and citation indexes to volume two, have now been issued. ICES has provided for Mr. Margetts to prepare subject indexes during 1961.

Although for the present the subject classification previously used by ICES is being continued, this is not entirely suitable for a comprehensive world bibliography, and it is hoped that eventually the FAO Decimal Classification for Fisheries Science will be revised, and made suitable for this purpose. A beginning is being made in this direction by an arrangement with Dr. Groen (Netherlands) a member of whose staff will prepare current subject indexes in great detail for physical and chemical oceanography, using the recently revised section of the Universal Decimal Classification pertinent to this subject. These indexes will be regularly published in the FAO Current Bibliography.

The Bibliography now gives advance notices of meetings, courses, etc. During 1961-3 it will be reorganized to include in a separate section prepublication announcements of research activities.

The explanatory section and the indexes of the bibliography will be issued in several languages.

The bibliographic operations, as part of a comprehensive intelligence service are described in a publication FB/60/T2 (Rev. 1), distributed

at the 9th IPFC Session as a contributed publication (Reprinted from Rev. Doc. 27 (3): 108-18, 1960).

Some countries and research institutes are collaborating by arranging to prepare synopses of biological data for species in which they are most interested, and to publish these in the exact format adopted by FAO so that they are interchangeable and can be considered as within the same series. FAO proposes to publish in the "Current Bibliography" announcements of such synopses completed or known to be in preparation; a similar arrangement will be made with regard to the contributions to the new Serial Atlas described under "Oceanography".

FAO is collaborating with an international committee under the chairmanship of Professor Hiatt and with UNESCO in the preparation of a World Directory of Oceanographic and Limnological Institutions; and is maintaining a register of fisheries scientists. This register now includes 4,000 names, and from time to time, indexed lists are being issued of the names and addresses of scientists working in specific subject fields. The first of these lists, within the series "FAO Fisheries Biology Technical Papers" just issued, deals with algologists.

With reference to the recommendation of the 29th IPFC Executive Committee meeting that the Secretary should examine means of making translations of fisheries documentation in other languages into English and French available to IPFC members, it should be noted that the "Current Bibliography" now provides through its citation indexes a means of tracing the existence of translations, or of translations in progress, in any language.

b. Reference books (Manuals and Handbooks) (*Recommendation B-2*)

Dr. G.L. Kesteven (CSIRO, Australia) continues to act as General Editor of the series "FAO Manuals in Fisheries Science". The first of this series, "Manual of Field Methods in Fisheries Biology" has been printed in provisional edition and given a wide distribution. A group of specialists have been asked to comment on it, and their suggestions will be included

in the definitive edition. A first draft of the general volume in the series, "Fisheries Science", will be available in mimeographed form soon.

Revision of the "Manual on Laboratory Methods" which was earlier given limited distribution in mimeographed form is now nearly complete, as also is Mr. Gulland's "Manual on Sampling Methods." The "Manual on Fishery Assessment Methods" is however not well advanced, though some of the material which will be included in it has been distributed in the form of the mimeographed lecture notes of the Rastrelliger Training Centre.

2. AQUATIC RESOURCE APPRAISAL

a. Tunas

(*Recommendation A-19*)

[The IPFC Executive Committee noted, at its 29th meeting, that there is an apparent diminution of activity in this field and in the interest by many Member Governments of the Indo-Pacific region.]

(i) FAO

The success of the World Sardine Meeting led to a proposal to hold a similar meeting on tunas. At first it was intended that this meeting should deal with economics and technology, as well as with biology. It has now been decided that more time would be required to prepare for a comprehensive meeting, and that therefore the Fisheries Division would first convene a meeting on the biology of tunas. This will be held in the U.S.A. in 1962. A panel of consultants to prepare the meeting has been set up and a prospectus and invitations will be issued soon.

Some regional meetings will be a valuable preliminary for the World meeting. The General Fisheries Council for the Mediterranean held a special discussion on tuna biology at its meeting in Rome, September 1960, and the Commission for Technical Cooperation in Africa South of the Sahara has convened a symposium on African tuna fisheries in December 1960. There will also be a symposium on tunas in the Pacific during the next Pacific Science Congress in Honolulu, 1961.

The cooperation of the IPFC is solicited in encouraging the preparation of papers for the meeting and participation in it by research workers from the region. The prospectus will describe in detail the types of contributions solicited and the subjects to be covered.

(ii) Australia

The work on the ecologic association of tuna with characteristic water mass features is mentioned under "Oceanography". Tagging of southern Blue-fin, *Thunnus thynnus maccoyii* has shown the movement of tuna from the vicinity of Eden in southern New Wales to the region of Port Lincoln in South Australia. Commercial production of blue-fin tuna continues to increase.

(iii) Ceylon

Taxonomic studies of the tunas has been undertaken.

Experiments are under way to test the effect of varying the length of the branch lines and buoy lines of long-line fishing gear on the catches of tuna at different distances from the shore up to 100 miles west of Colombo. The influence of temperature, currents and water colour on the efficiency of the long-line gear at different depths is also being investigated.

Investigations have been designed and are being carried out to explore the possibilities of freezing suitable bait fish when they are caught in quantity and making them available when fresh bait is scarce. In Colombo, fishermen who have been using this frozen bait have reported favourable results. A comparative study of the various species suitable for bait in fishing for tuna is being carried out.

(iv) France

Les recherches ont continuées comme par le passé à partir de deux séries de résultats obtenus par l' "Orsom III";

- a) pêche à la traîne donnant des éléments surtout pour les Yellowfins.
- b) pêche à la longue-ligne japonaise, fournissent des résultats pour l'Albacore, et secondairement les gros Yellowfins et les Espadons.

En ce que concerne le premier point, un rapport de synthèse été publié (R.S. no. 11.) et adressé à l'I.P.F.C, il fait le point des données acquises sur la biologie des Yellowfins de la région de 1956 à 1959 (cycle sexuel, taille, contenus stomacaux, biométrie et populations). Compte tenu de ce que vous avez sans doute ce rapport en mains, j'y ajouterai seulement que de nouvelles données ont été obtenus depuis, qui sont encore peu exploitées. Elles confirment, d'une part les grandes lignes du cycle sexuel observé précédemment et d'autre part, avec une grande exactitude, la moyenne très basse notée pour les branchio-spines.

D'autres rapports ont été rédigés et vous ont été également adressés sur les possibilités de pêche par les deux méthodes citées dans notre zone de travail.

En ce qui concerne la longue-ligne, 14 stations ont été faites dans une même région en 3 séries distinctes (Janvier et Mai 1959, Juin 1960) en y a pris en tout 83 Albacores pesant entre 18 et 23 kg., 25 Yellowfins, 20 Espadons pour un total de 4.362 hameçons. Ce rendement est sensiblement inférieur à celui des pêches japonaises ce qui peut s'expliquer plutôt par l'insuffisance de longueur de l'engin (500 hameçons seulement) eu une imperfection de la méthode, encore en cours de mise au point à bord de notre navire, que par le lieu choisi. Il est à noter que tous les Albacores ont été pris sur la partie de la ligne pêchent le plus profondément. En Mai-Juin les poissons étaient dans un état sexuel assimilable à la fin de la période de ponte, en Janvier l'indice de développement des gonades était élevé; 10 Bigayes furent capturés en Mai 1959. Les dégâts causés par les requins n'ont été sensibles qu'au Janvier 1959.

(v) India

Studies on the biology of *Katsuwonus pelamis* and its fishery in the Minicoy Island region, in the Laccadive archipelago, were conducted at the Central Marine Fisheries Research Station. Studies pertaining to the food habits of the tuna and the abundance and distribution of different organisms which form important food of the species. The seasonal cycle of maturity, sex ratio, fecundity and spawning of the fish were also studied.

(vi) Indonesia

Preliminary investigations on the food and feeding habits of two common tuna-like fishes from the Java sea, *Euthynnus affinis* and *Neothunnus rarus*, showed that both were feeding mostly on anchovies and sprats (*Stolephorus* and *Dussumieria*). They were active during the morning and afternoon, but at night dense schools were also found preying on anchovies. Both fishes occur the whole year round, with the peak during the rainy season when anchovies are found in great abundance.

(vii) Japan

With respect to such species of tunas as bluefin, yellowfin, bigeye and albacore, investigations have been in progress at the Nankai Regional Laboratory. The number of taggings carried out by the laboratory staff was 196 for yellowfin, 656 for albacore in 1958, and 387 for yellowfin in 1959.

(viii) Malaya

Although a tuna fishery operates from Penang, no research is being done on the fishery.

Tuna fishing was started as a private, joint Malayan-Japanese venture during the latter part of 1959. Initially one Japanese fishing vessel contracted to supply the company with tuna, landed from 45 tons per trip lasting about 30 days. At present 5 vessels of 100 to 150 tons are actively employed in fishing for the company, and it is expected that some 5,500,000 lbs. of tuna will be landed annually.

The main species of tuna landed are:

Albacore	—	<i>Thunnus alalunga</i>
Blue Fin Tuna	—	<i>Thunnus thynnus</i>
Big Eye Tuna	—	<i>Parathunnus obesus</i>
Yellow Fin Tuna	—	<i>Neothunnus albacora</i>

There are adequate refrigerating, canning and processing facilities in Penang and the commercial products are canned tuna, tuna sausages, fish meal and fish powder, and fish liver oil; these are mainly exported.

(ix) Philippines

Since the acquisition from Japan of the M/V "Malasugui" (110 tons gross), three ex-

ploratory cruises, each of from 4 to 6 weeks duration, on long-lining for tuna in the southern part of the Philippines (Sulu Sea and Celebes Sea) have been undertaken.

Technological studies were conducted on the presence or absence of lead weight, position of lead weight, length of branch lines, length of main line and number of hooks per basket.

During these cruises two assistants undertake the recording of oceanographic data and biological data on the catch. The catch is studied with regard to fork and standard lengths, weight, sex, stage of maturity of the gonads, stomach contents and parasites.

Starting with the second cruise, morphometric data on tuna and spearfishes were taken for racial and specific determinations. Bathythermograph soundings are taken and are used to determine the position (depth) of the 23°C layer which is the most favourable temperature for the deep swimming tuna.

During the first cruise, 32 yellow fins with a total weight of 1,085.7 kgs. and 8 big-eyed tuna with a total weight of 370.41 kgs. were caught.

During the second cruise, the catch consisted of yellow fins, big-eyed tuna, albacores, blue marlins, sword-fishes, sailfishes, sharks and others with a total weight of 6,514.8 kgs.

During the third technical cruise the catch consisted of yellow fins, big-eyed tuna, albacores, sailfish, swordfish, striped marlin and snake mackerels with a total of 1,600.2 kgs.

With the increased activities in tuna long-line exploration, more studies will be undertaken in this regard in the future.

(x) UK (Colony of North Borneo)

In December 1959 an application by the Taiyo Fishery Co., Japan, was approved for development of the tuna industry based on Si Amil Island, where a processing plant will be built. Five boats, 30-40 gross tons and a crew of 30 men each, using pole and line will be employed. The catch will be processed into canned (tuna and bonito), dried bonito and fish meal.

A factory ship (4,000 tons) will be used to process the catch prior to the establishment of the shore base.

In December 1959, the Company sent "Azuma Maru No. 5", to the waters adjacent to Si Amil Island to carry out fishing tests. The Assistant Fisheries Officer, Chin Phui Kong was on board during this trip which lasted only for one morning owing to the shortage of live bait (mainly anchovies, (*Engraulis* sp.) and small horse mackerel (*Caranx* sp.) caught in Japanese waters).

Tuna caught were skipjack which forms the bulk of the catch (about 95%) and yellow fin (*Neothunnus macropterus*).

The fishing master believed that with live bait he would have been able to catch 30 tons in that day.

(xi) U.S.A. (Hawaii)

Important investigations dealt with (1) the behaviour of tuna, especially skipjack, *Katsuwonus pelamis*, and (2) the relation between changes in the availability of skipjack in the Hawaiian fishery and changes in the environment.

Field studies of the behaviour of tuna were facilitated by the addition of two underwater observation chambers to the research vessel "Charles H. Gilbert." With their aid the reaction of skipjack to changes in fishing procedures, such as changes in rate of chumming, species of chum, and elimination of water sprays, was observed during cruises in the central and eastern Pacific.

A major advance in the behaviour studies was the development of a technique for transporting and establishing skipjack in tanks. This involved catching the fish by hook and line and dropping it without handling into a portable tank through which sea water was circulated. This tank was then deposited in the pond and the skipjack released through a side port, again without handling. With this method skipjack have been kept in a 24-foot diameter pond for a period of 5½ months. If the fish were handled, death would invariably ensue in approximately two days.

The results of five cruises in Hawaiian waters during 1959 showed that there was a northward retreat of the Western North Pacific water during the spring. This appeared to be associated with the increase in availability of skipjack in the Hawaiian fishery during the spring and summer. There was some indication that skipjack were more plentiful near a boundary between the Western North Pacific water and the intermediate salinity water to the south. The abundance of zooplankton in the different waters surveyed did not vary significantly.

In 1960 a cruise was made to test the hypothesis that the spawning ground of albacore in the North Pacific is located to the west of the Hawaiian Island. Although a few albacore larvae were tentatively identified in the plankton catches, the importance of this area for albacore spawning is not clear.

A small number of skipjack were tagged and released during 1959 in Hawaiian waters, and during 1960 in eastern Pacific waters. Recoveries of those released in the eastern Pacific amounted to 24%, but as in Hawaiian waters no extensive migrations were shown.

A five-year study of the distribution of albacore in the North Pacific as related to physical and biological oceanographic factors was terminated, as also was a 2½ year exploratory oceanographic and fishery study of the waters of French Oceania. Both studies showed that there is a great annual variation in the apparent abundance of tuna in these areas.

Supplemental bait supplies for the Hawaiian live-bait fishery were investigated including tank-reared *Tilapia*, thread fin shad, obtained from the U.S. mainland, and sardines transplanted from French Oceania to Hawaiian waters.

The publications listed in Annex A summarise the earlier studies which were completed since the 8th Session of the IPFC.

b. Mackerels

(Recommendations A - 16, B - 8)

(i) FAO

The Report and Lectures of the Rastrel-liger Training Centre held at Bangkok in 1958

have now been issued and distributed widely to mackerel research workers throughout the world and comments invited; some of these are appended (Annex B).

Definition of "Mackerel"

The IPFC Executive Committee agreed (with one small change) with a definition proposed by the Technical Secretary, viz: "Fish of the genera *Scomber*, *Rastrelliger*, *Pneumatophorus* and *Scomberomorus*, and closely related genera".

Fish measuring

A prototype one-man measuring board was made and tested at Lowestoft, England. FAO distributed 25 copies of this (at a cost of U.S.\$3 each) to laboratories in the region; the results of their trial under field conditions are awaited. Descriptions of this board and also of one designed in the Philippines were published as IPFC Occasional Papers 59/10 and 60/3.

The section of the *Rastrelliger* Training Centre report on length measuring was used as the basis for discussion of that subject at the World Scientific Meeting on the Biology of Sardines and Related Species, and a version of it, revised and expanded as a result of these discussions, has been incorporated in the "Manual of Field Methods in Fisheries Biology" now published by FAO.

(ii) Ceylon

Investigations on mackerel were made according to proposals recommended at the *Rastrelliger* Training Centre, 1958. Sampling for measurement of length was almost entirely limited to those fish available at the Colombo market which received supplies from nearly all fish landing centres. Separate visits to these centres were not very useful as the catch obtained there each day proved at most times to be very small; furthermore, the total fish landings of 1959 and 1960 seemed to be generally poorer than in earlier years.

Data collected since January 1959 have been partly analysed and the following results indicated:—

- (a) There are two species of mackerel one of which (*Rastrelliger kanagurta*) is by far the more important in Ceylon fisheries.
- (b) Nearly all mackerel were mature fish and were captured with beach seines. Smaller-sized fish entered the fishery in the July-October period and some of them appeared to maintain the fishery thereafter until the corresponding period of the following year. (Grouping of total length measurements by month of collection often showed a single mode from November to June). This trend of recruitment of stocks was observed in both east and west coastal fisheries, where the principal fishing season alternated according to the two monsoons.
- (c) Breeding season as deduced from observations on gonad ripening was also more or less identical in mackerel from the two coastal fisheries.
- (d) Food organisms present in the stomach included both phytoplankton and zooplankton, mainly diatoms and copepods.
- (e) Four species of larval cestodes encysted in the body cavity and one species of copepod attached to median fins have been identified among the parasitic organisms of mackerel.
- (f) Since mackerels did not form a major constituent of beach seine landings, no analyses of fishing efforts, etc. have been made. However, the total mackerel landings data as reported by the Field Staff were recorded and tabulated by the Statistics Section of the Department.

This investigation was started in January 1959 and is being continued as the principal work of one Research Officer, assisted by a Laboratory Technician.

(iii) **India**

Studies on the fishery and biology of *Rastrelliger kanagurta* were carried out at various centres. Investigations related to racial studies, breeding biology and food habits. Observations on total catches, catch per unit of effort, and size structure of the catches were also made. It was observed that, generally, stocks do not inter-mingle and that shoals are comprised of a single age class, mostly juveniles. Spawning appeared to take place in the months of April-June.

Such of the recommendations of the Rastrelliger Training Centre as can be implemented with existing facilities are being acted upon. Attention has been given to the proposal to exchange scale samples. The recording of length measurements for compilation and publication in a suitable manner through the Council is considered necessary to ensure uniformity, and it would be useful to exchange identical impressions of the same set of scales. Cellulose acetate impressions of scales would be more convenient to handle for sending to different laboratories, but it would be difficult to procure these slides or cards locally in the country. It is suggested that the IPFC may consider the possibility of distribution of the same types of press and cellulose cards to the different workers in the region, in view of the necessity to have uniform approaches to the problem, as part of a group country project.

(iv) **Indonesia**

Growth rate studies on "kembung" are in progress, since it is known that the schools of *Rastrelliger* caught West of Kalimantan are formed by one population.

Fish caught during the months of July-August are below 10 cm. (standard length). Fish caught around December-January reach 13 cm. Those caught in May have a length of 14-15 cm. and show ripe gonads while some are already spent. Spawning occurs during the months of June-July.

(v) **Japan**

In Japan commercial catches of mackerels ("saba") include *Pneumatophorus japonicus* and *P. tapeinocephalus*. The former is caught in almost every part of the sea around Japan, with the amount of landings far greater than that of the latter which is caught mainly in the southern part of waters neighbouring Japan.

It has been long sought to strengthen the present research system in order to develop investigation of mackerel resources. With this fact in mind it is considered to be most appropriate to have included all the mackerels as pertinent items in the Rastrelliger Sub-Committee of IPFC.

(vi) **Korea**

Regret has been expressed that at its 8th Session the Council extended the terms of reference of the Rastrelliger Sub-Committee to include other mackerel species, since at first sessions Korea had expressed herself against the proposal for the international joint investigation of the mackerel resources in the Korean waters, because of the political problems occasioned by the fisheries dispute with a neighbouring country.

Under the circumstances and in view of the comments made it was generally assumed that Korea did not wish to participate in the activities of the Mackerel Sub-Committee and naturally the Council would not adopt an intransigent attitude in this connection. Documents sent to Korea therefore were largely for the purpose of information.

[IPFC/C61/WP 31 provided information on the mackerel investigations in Korea.]

(vii) **Malaya**

The *Rastrelliger* is the only mackerel being investigated at present. The lines of investigations follow those recommended at the Bangkok Training Centre.

The following aspects are being investigated: length-frequency distribution of catches;

main foods and preferences; gonad development, size at first maturity, to determine breeding season and fecundity; plankton in relation to food and its possible relationship to its migratory habits (also for eggs and larvae); hydrological investigations in conjunction with plankton work especially temperature, salinity, oxygen, phosphates, nitrates and hydrogen-ion concentration; fishing effort of the Rastrelliger purse seine fleet.

A preliminary report on the Rastrelliger fishery in Malaya has been contributed to the 9th IPFC Session (IPFC/C 61/TECH 28).

(viii) Philippines

The most common commercial species are identical with *R. kanagurta* (alumahan) and *R. neglectus* (hasa-hasa) as reported in the Rastrelliger Training Centre. Biological research work on this field was started in February 1957.

Data gathered from January 1958 to December 1959 have been processed and include:— (a) length frequency composition, (b) length-weight correlation, (c) maturity stages of gonads, (d) morphometric measurement for taxonomic and racial differentiations, (e) food and feeding habits, (f) fecundity, length and weight of gonads and (g) stock assessment.

The geographical field of study has been narrowed down to Manila Bay species and those that reach the Manila Bay area from fishing grounds in the south. For *R. kanagurta*, 34 samples with a total of 1,895 specimens and for *R. neglectus*, 105 samples with a total of 7,743 specimens were collected and studied in detail.

The following observations were noted:

1. The smallest size group in *R. neglectus* with a mean length of 58 mm. entered the fishery of Manila Bay during December, while 68 mm. was observed for *R. kanagurta* during March.

2. A maximum mean length of 195.5 mm. was observed during April in *R. neglectus*, and one of 262 mm. during October for *R. kanagurta*.

3. There appears to be separate schooling behaviours for the males and females of the species of *Rastrelliger*.

4. Only maturity stages of the ovaries up to IV were observed, in both species.

It appears that young of both species are taken during most of the year by bag net ("basnigan"). There seems to be a mixture of *Pneumatophorus australasicus* and *P. japonicus* in this fishery. Studies on these species have been started.

The longer specimens of *R. neglectus* are caught by otter trawl in Manila Bay, indicating that during day time the species does not shoal at the surface.

(ix) Thailand

The Rastrelliger fishery research programme in Thailand was described in a report submitted to the 9th Session of IPFC. (IPFC/C 61/WP 20.)

A translation of a report on a tagging experiment which had been conducted in Thailand is appended (Annex C).

The chairman of the Rastrelliger sub-committee, Mr. Sant Banthukul, visited in 1960, the Tokai Laboratory, Tokyo, under a Colombo plan scheme. Other Thai scientists will go at a later date.

c. Sardines

(Recommendation C - 11)

(i) FAO

A World Meeting on the Biology of Sardines and Related Species was held in Rome in September 1959, with many contributions from the Indo-Pacific area. The documents of the meeting and the draft report have been distributed to participating governments and scientists. The Report and all the Contributed Papers have now been edited and are in the press; the resulting book, which will be distributed during 1961, will be an authoritative summary of present knowledge and of current research activities and methods with proposals for future programs, including proposed standard terminology, definition and methods.

Action is now being taken to follow up the meeting. Mr. E. Akyuz, of the Fisheries

Biology Branch, is acting as a special rapporteur on this matter for the GFCM which has drafted a comprehensive research program for its area.

(ii) **Australia**

A small sardine fishery has commenced in Victoria, supplying a newly outfitted cannery.

(iii) **Ceylon**

Sardines form an important component of the beach seine fishery. Studies on this fishery were suspended a few years back and have not yet been resumed.

(iv) **India**

Studies on the fishery biology of *Sardinella longiceps* were carried out at various research centres. Investigations pertained to the size structure of the catches, age and growth, breeding biology and fluctuations in the magnitude of the fisheries.

(v) **Indonesia**

The sardine fishery in the Bali Strait is dominated by the light fishery. A small sailing vessel carrying a kerosene lamp and dipnet is the principal craft and gear commonly observed along the Strait. Since submerged lamps attract fish more successfully, an experimental lamphouse was built. This lamphouse, consisting of a square wooden box, has such a construction that it is able to float with the opening upwards, just projecting above the surface of the water. The lower part, submerged in the water, has aquarium-like glass walls enabling the light to shine directly into the water when the lamp is put inside. According to a preliminary report, this lamphouse attracts fish more effectively than the present common surface lamp. However, in rough weather the lamphouse shakes heavily, preventing the light from concentrating directly in the water.

(vi) **Japan**

Since 1949 investigation programs for sardine have been kept in progress along with two allied species, anchovy and round herring,

all known by a Japanese commercial name "iwashi". The results so far obtained suggested the necessity of concentrating work upon variations in the recruitment. Consequently, it has been emphasized that a greater effort should be paid to studies on a major factor governing the variation, i.e. the relation between natural mortality of the young in the pre-exploitable phase and their environmental conditions. Some important subjects drawing greater attention at present are those pertaining to survival of the sardine at their post-larval stage, and distribution and density of food organisms for them. The following are papers submitted from Japan to the World Scientific Meeting on the Biology of Sardines and Related Species, 1959.

Hayashi, S. : Recent fluctuations in the sardine stocks off the East Coast of Honshu. (Experience Paper No. 8)

Kurita, S. : Causes of fluctuations in the sardine population off Japan. (Experience Paper No. 1)

Nakai, Z. : Changes in the population and catch of the Far East Sardine area. (Stock and Area Paper No. 5)

Nakai, Z. : Fluctuations in abundance and availability of sardine populations caused by abiotic factors. (Methodological Paper No. 4)

Sardine Re- : Synopsis on the biology of sources Di- *Sardinops melanosticta* (T. vision, To- & S.). (Species Synopsis kai Reg.Fish. No. 6)
Res. Lab.

Uda, M. : The fluctuation of the sardine fishery in the Oriental waters. (Experience Paper No. 2)

Yamanaka, I. : Comparative study of the population size of Japanese and California sardine. (Experience Paper No. 19)

(vii) **Philippines**

Biological study was started in March 1959. Four species are now definitely identified: *Sardinella fimbriata*, *S. perforata*, *S. longiceps* and *S. sirm*. The study includes the determination of sexes and degree of maturity, stomach contents, fecundity, age determination by the Petersen method, identification of species and variation within species by meristic characters.

Knowledge on migration, local movements, schooling and population characteristics is very meager. The only phase in the biology of sardines from which data and information can be sufficiently furnished, is on their exploitation. Sardines are largely caught with bagnets, round haul seines, lampara nets; beach seines, gill nets, and fish corrals, all of which are operated with either powered or non-powered boats. In most places, sardines can be caught in small quantities for a great part of the year and in considerable amounts during the other months. Juveniles known as "silinyasi" or "lupoy" comprise a large portion of the sardine fishery. For both adults and juveniles, the duration and peaks of the fishing seasons vary.

Sardinella fimbriata and *S. perforata* are at present readily available in Manila Bay while *S. longiceps* and *S. sirm* are available from catches in Palawan waters and in the open sea with the use of bag nets (basnigan).

(viii) **USA (Hawaii)**

The Marquesan sardine, *Harengula vittata*, was successfully introduced into Hawaiian waters from the Marquesas Islands as a potential bait fish for tuna fishing. (Details are published: G.I. Murphy, *Pacific Science*, XIV(2): 185-187).

Prior to the establishment of this sardine a biological study was undertaken in the Marquesas Islands for two purposes: (1) to better define the ecological niche of the sardine in order to estimate its effects on the Hawaiian fauna, and (2) to provide comparative material for later studies of the sardine in the Hawaiian Islands. The findings are briefly given below:

1. The nomenclature of the Marquesan sardine is uncertain because of the inability to decide whether it belongs to the genus *Sardinella*, or to *Harengula*. The name *Harengula vittata* is used provisionally.
2. In the Marquesas Islands group, French Oceania, the Marquesan sardine was found only in bays.
3. The sardine feeds on plankton both particulately and by filtering.
4. 56.4% of sardines are infected with a Hemurid trematode.
5. The sardine spawns more than once on an undetermined time scale. Spawning takes place throughout the year. Size at maturity of females is, 84 mm. + 15 mm. standard length. From 1000 to 8000 ova are spawned at one time.
6. Females grow to a larger size than males.
7. Sardines were found in 14 bays of the Marquesas. The total population was estimated at 14,192 pounds in January and February, 1957. At Taiohae Bay, Nuku Hiva, where most of the field sampling was conducted, estimates of excess production were 500 pounds monthly.

d. Chanos

(Recommendation A - 12)

(i) FAO

The "Synopsis of Biological Data on Milkfish" by W.H. Schuster (IPFC Occasional Paper 59/3) has been revised and is being issued as "FAO Fisheries Biology Synopsis No. 4", 1960. A few advance copies were available at the 9th IPFC Session.

T.G. Pillai of Ceylon has completed a FAO fellowship involving six months travel in the Philippines, Indonesia and Hong Kong. His final report to FAO which deals mainly with *Chanos* farming will be issued early in 1961 in "the FAO Fisheries Biology Technical Papers"

series and distributed to IPFC Technical Committee I members. The report refers also to the culture of siganids, shrimps, oysters and mussels, fish culture in rice fields, and inland fisheries generally in the countries visited.

(ii) **Ceylon**

Steps have been taken to introduce both *Chanos* and *Mugil* culture to Ceylon. The surveys of the seasonal occurrence of *Chanos* and *Mugil* fry and fingerlings have indicated that they are abundantly available. Preliminary experiments on *Chanos* and *Mugil* culture have yielded encouraging results as to the feasibility of the establishment of brackish water fish farming in Ceylon.

(iii) **India**

Investigations were continued at Mandapam, mainly to elucidate factors responsible for the large scale incursions of *Chanos* fry into certain creeks along the shore, and to determine their preferred environmental conditions. Indications were that it was the slightly higher temperatures (essential for the sustenance of the relatively higher metabolic rates of the fry) at the fringes of the shallow creeks, and not the occurrence of any particular food item, that were responsible for the congregation of fry in those areas. Experience on techniques of *Chanos* culture in marine fish farms, with particular reference to increasing the survival rate of stocked fry, and assessing the relative efficiency of artificial feeding and manuring of ponds in increasing the growth of fish, and in nursery management, were also conducted at the Research Station.

(iv) **Philippines**

The present status and extent of development of the *Chanos* fishery in the Philippines has been described in the form of a report to the *Chanos* Sub-Committee. (IPFC/C61/TECH 31)

(v) **Vietnam**

The present status of research and development of the *Chanos* fishery in Vietnam has also been described in a report which discusses the occurrence of *Chanos*, primitive fish culture, investigations, collection of larvae, pond culture and management, etc. (IPFC/C 61/TECH 32)

e. **Hilsa**

(Recommendation A-15)

(i) **FAO**

A report to the Government of Pakistan on the *Hilsa* Fishery and Fish Passes has been published as ETAP/FAO Report 1008, 1959.

(ii) **India**

During the 1958-59 and 1959-60 periods, the *Hilsa* fisheries continued to be extremely poor. The migration of *Hilsa* up the river Hooghly in 1958-59 was unusually delayed, probably on account of the late and scanty rainfall. However, there were sudden revivals of the winter fishery in the Sunderbans area as well as on the Midnapore Coast in December 1958 as well as November-December 1959, but these were only of very short duration. Environmental studies indicated that these periods coincided with periods of marked increase in phytoplankton, especially of the diatom *Coscinodiscus*. This observation has given added support to the inference made on the basis of previous years' studies, that probably the quantity of plankton is an important factor determining the success or failure of the fishery.

Collection of catch statistics

Arrangements for the collection of catch statistics of the *Hilsa* fisheries on an all-India basis have been finalised during the period. The data relating to *Hilsa* are being collected along with those of other species as a part of other investigations from a number of areas. The remaining areas are being covered by the *Hilsa* Investigation staff or the staff of the State Fisheries Departments. The compilation of data collected from different sources is in progress. In West Bengal, where *Hilsa* fisheries are of the greatest importance, it was found that the production in the River Padma was much more than in the Hooghly during both the years. The total quantity landed from the small stretch of the river in the Indian territory was about 657 metric tons in 1958-59 and 646 tons in 1959-60. The catch per unit effort was also many times greater in the River Padma than in either Hooghly or the River Godavary for which data are readily available.

Age composition of commercial catches

A programme of market measurements for the study of the age composition of catches is being attempted on an all-India scale even though the staff available for the work is very limited.

In both the years under report, the IV year age group predominated in the catches from the rivers Hooghly, Padma and Godavari. In Padma, however, a fresh group of two year old fish entered the fishery in October, 1958 and gained prominence over the older age groups by December 1958. In Chilka Lake, I to V years old *Hilsa* contributed to the fishery, the II and III year groups forming the predominant age groups in 1959-60. The bulk of the catches from the Saurashtra Coast appear to belong to the V year group.

Racial investigations

The analysis of the morphometric data collected so far has been completed. The comparisons of non-meristic characters show that the populations of *Hilsa* of Ganga, Padma, Chilka, Godavary and Saurashtra Coast can be distinguished from the *Hilsa* of the Hooghly by the regression of head length on total length alone. (There are also other significant characters by which these populations can be distinguished.) Similarly, the populations of Brahmaputra, Krishna and Narbada can be distinguished by the regression of body height alone. On the basis of total number of vertebrae the *Hilsa* of Cauvery and of Saurashtra Coast can be distinguished from the rest. The average number of vertebrae for Cauvery samples is 44.5 and for Saurashtra 45.5, whereas it is less than 44.5 in samples from all other areas. The populations of Krishna River and Ganga can be recognised from the others by the average number of trunk vertebrae which are 12.1 and 12.48 respectively. Populations of Chilka, Brahmaputra and Narbada can be distinguished by the average number of caudal vertebrae without haemal spines, which are 11.24, 11.52 and 11.8 respectively. The stock of Padma River can be distinguished from the others by the low average number of vertebrae with duplicate neural spines (20.5).

The fishermen and fish traders generally differentiate *Hilsa* from different river systems by their taste which seems to be governed mostly by the fat contents. With a view to determining whether there are any significant differences in the fat contents of fish from the different river systems, analyses of samples (both females and males) of the same stage of maturity collected during the breeding season from different systems, etc, were carried out. Marked differences were noticed. The average percentages of fat contents of samples from different sources are given below:

Mahanadi River	19.28
Saurashtra Coast	16.73
Padma River	14.40
Godavari	10.70
Krishna River	8.50
Brahmaputra	7.15
Narbada River	5.40

Young fish surveys

Experimental operations of small-meshed bag nets for the assessment of the abundance of young *Hilsa* were conducted in the Hooghly with a view to evolving a standard method of survey. An analysis of comparative data collected during the period showed that the figures of catch per high tide, obtained by the operation of a standard-sized bag net with upper margin of the mouth above the surface of water would be a suitable criterion for studying abundance of young *Hilsa* in different years, seasons or localities. Quantitative surveys are now being carried out following this technique in the Hooghly River and are proposed to be extended to other river systems also.

Tagging experiments

To enable large-scale tagging of *Hilsa*, an inexpensive nylon streamer tag was designed and hand-fabricated with mostly locally available material. The tag which consists of a rectangular vinyl plastic strip with the necessary explanatory legend written in the regional language or English by hand with vinyl stamping black ink, and a braided nylon streamer costs only about

a rupee per hundred. After a number of preliminary experiments, a suitable method for tagging *Hilsa*, which is considered an extremely delicate fish, has been evolved.

The first phase of the tagging programme was designed to study the migratory features of the fish and the intermingling of stocks. During the period about 1,400 fish were tagged in the Hooghly, Padma and Ganga. The total percentage of recovery was about 8.4. Propaganda among fishermen is being intensified to improve the recovery. The results of the experiment obtained so far seem to indicate that the direction of migration of mature or maturing *Hilsa* is not always up-river as generally believed. A number of tagged fish have been recovered from downstream fishing grounds also. Some of the fish have been observed to migrate down-stream and then ascend tributaries. The longest distance observed to have been covered by a migrating *Hilsa* was about 260 miles in 2½ months' time. Fish tagged in the Padma have been recovered from East Pakistan rivers from the neighbourhood of Goalundo. More active co-operation of Pakistan authorities is required to get better recoveries.

Investigations are continuing at the Central Inland Fisheries Research Station principally on the following aspects.

1. Estimation of total catch, catch-per-unit-of-effort, and age and size structure of the catches in the more important river systems.
2. A quantitative survey of young *Hilsa* in the Hooghly estuary, to determine the spawning success and survival every year, with a view to elucidate their role in determining the fluctuations of the fishery.
3. Racial studies by the analysis of meristic and non-meristic characters and fat content. These studies indicated that the stocks of all the major river systems sustain independent populations.
4. Environmental studies to determine the causes of fluctuations of the *Hilsa*

fisheries indicated a probable correlation between turbidity and abundance of plankton, particularly the diatom *Coscinodiscus* sp., and the shoaling of *Hilsa*.

5. Tagging experiments. Of the near 2,000 *Hilsa* tagged so far with an inexpensive nylon streamer tag, 7.17% have been recovered. These experiments indicate that the stocks of *Hilsa* from the Hooghly and the Rupnarain intermingle; that fish migrate from the Hooghly to the Churni river; and that speeds of migrations are highly variable.

(iii) Pakistan

To take due part in this programme, the Food and Agriculture Council of Pakistan sanctioned two investigation schemes, one each for West and East Pakistan. The work was undertaken by the Central Fisheries Department, in West Pakistan in 1955 with headquarters at Karachi, and in East Pakistan in 1956, with the headquarters at Chittagong which was later shifted to Chandpur in May 1960. The results achieved with the limited personnel and facilities can be summarised as follows:

In West Pakistan only the river Indus supports a *Hilsa* run. *Hilsa* starts ascending from the middle of February and ends its run in the middle of October, the peak season being from May to July. Prior to the construction of the Ghulam Mohammad Barrage in 1955, *Hilsa* used to ascend up to Sukker Barrage, but it is now restricted to the G.M. Barrage only.

In East Pakistan, with its network of rivers, *Hilsa* is available almost throughout the year. There are two runs, one in winter which is a slack season and the other in summer (May to October) which provides the bulk of the total catch.

The fishery and its management: In West Pakistan, there is 150 river-miles of fishing area which is divided, for the present, into three fishing zones for the purpose of administration. The fishing rights are auctioned every year by the District Local Boards.

In East Pakistan, the various fishing centres are put into nine different fishing zones for the investigational programme.

Catch statistics: Catch statistics are available in Pakistan since the commencement of the scheme.

In West Pakistan, the total production in 1958 increased to 6 million pounds as against 4 million pounds in 1955, but in 1959 this decreased to 2 million pounds and in 1960 declined to somewhat more than 1.7 million pounds.

In East Pakistan, the catch is estimated at 400 million pounds every year. In 1960 this catch fell to about 300 million pounds. *Hilsa* was not available in the upper reaches of Padma and Jamuna especially in the Northern region probable due to the silting and construction of a barrage.

Fishermen population: In West Pakistan, the fishermen above the G.M. Barrage migrate seasonally down to the barrage for *Hilsa* fishing. The number of active fisherfolk varies from 5,000 to 7,000 according to the abundance of *Hilsa* in the river Indus.

In East Pakistan, the fishermen population is about 185,000 in the vast *Hilsa* fishing area.

Fishing gear and craft: In West Pakistan, *Hilsa* is caught by gill nets and beach seines (Bhan, Chava and Ojhani) operated by several men and hand lift nets (Sandh and Kalera) operated by a single person. There are about 3,251 nets of all kinds in this area.

Only two types of boats, Donda Beri & Bathela operated by 14 and 2 men, respectively, are in use. There are about 575 of them in the *Hilsa* fishing area.

In East Pakistan, there are 11 types of nets in use, which can be classified as under:—

1. Drag nets — Mone, Gulti, Tona.
2. Drift nets — Chandhi.
3. Hand lift nets — Shangla, Khorl,
Bowtey.
4. Cast nets — Bacheri.
5. Fixed nets — Banth, Thega,
Geraphi.

Another type of fixed net, called fixed engine, is now banned. There are 97,939 nets and 48,046 boats in use in the vast fishing area.

Morphological and anatomical studies: In West Pakistan, morphometrics of 312 specimens of *Hilsa* were studied in detail; these observations indicate the existence of only one stock of *Hilsa*.

In East Pakistan, 405 specimens of *Hilsa* were studied in detail and it appears that there may be two races of *Hilsa* in the rivers.

Length and weight relationship: In West Pakistan 21,210 *Hilsa* specimens of all sizes were measured, weighed and arranged into a class range of one centimeter intervals. Frequency graphs indicate that fish belonging to five groups i.e. male of 30 cms to 41 cms in fork length and female of 35 cms to 50 cms in fork length are entering the fishery.

In East Pakistan, the correlation coefficient between total length and body weight for different zones have been calculated for different groups of *Hilsa* in the Gangetic system. It is found to vary from 0.657 to 0.902.

Fecundity of *Hilsa*: In West Pakistan, 74 *Hilsa* with well-developed gonads were collected to find out the relationship between fecundity and body weight as well as length. The egg enumerations were done following Lehman's (1953) method. It was observed that the relationship between the fecundity and the body weight is linear, whereas the relationship between the fecundity and length is exponential, the equation being $E = Ae^{BL}$ (Pillay, 1955; Lehman, 1953; Davies, 1957). The fecundity of *Hilsa* in the river Indus ranges from 7 lakhs to 29 lakhs.

In East Pakistan, work on the study of fecundity has not been undertaken.

Collection of fingerlings and fry: In West Pakistan, a search for the fingerlings and fry of *Hilsa* was made using hand nets of $\frac{1}{2}$ " mesh in pools and ditches on both banks of the river Indus below the G.M. Barrage for 50 miles but no fry of *Hilsa* have been collected so far.

In East Pakistan, a search for fry with the help of a research launch was made in the rivers

Padma and Kaliganga. As a result fry of 6 mm. to 10 mm. were found. The exact location of the breeding grounds is still not known.

Feeding habits: In West Pakistan, gut contents of a large number of *Hilsa* specimens were studied to determine the percentage of zooplankton and phytoplankton. It has been found that *Hilsa* does not appear to feed during up river migration for spawning.

In East Pakistan, the gut contents of 37 specimens were studied. The food contents were analysed qualitatively and it was found that the food consists of green algae, copepods and the encysted larvae of trematodes.

Determination of age: In West Pakistan, scales of various available size groups were collected and preliminary studies were done with the help of a low power stereoscopic microscope. For reliable observations by the scale reading machine, one set of scales of 71 *Hilsa* specimens was sent to Mr. G.B. Talbot (U.S.A.), former FAO fishery expert in Pakistan. Conclusive results are still awaited, but according to a preliminary report from him, *Hilsa* of the age group of 4-5 years was predominant in the River Indus in 1959.

Conclusions & suggestions:

- (i) The examination of a number of fish has shown that there is only one species in the Indus and probably two races in the rivers of East Pakistan.
- (ii) It has been observed that *Hilsa* does not negotiate the fish ladder and the boat lock. It mostly goes towards the gates on the right side of the barrage, adjacent to the fish ladder.
- (iii) Some spent fishes were collected down the barrage which shows that the fish breeds there, but the number was very small indicating that spawning was very limited.
- (iv) No fry of *Hilsa* has so far been collected in the Indus but they have been found in the Padma and Kaliganga (East Pakistan).

- (v) It has been established that the catch in West Pakistan is dwindling, but there is no marked difference in East Pakistan.
- (vi) It is suggested that more detailed studies should be carried out on the ascent of *Hilsa* in the river Indus to find out whether the fall in the catch is really due to the erection of the Ghulam Mohammed Barrage and non-provision of effective fish passes. After this is done ways might be found to help the fish in going up the barrage for breeding.
- (vii) With the suggestions given in Talbot's report as a guide, it may also be observed whether imposition of closed days has any effect on the ascent of the fish.
- (viii) *Hilsa* is an important fish which besides providing good food supports a large number of fishermen. Sustained research is required on problems not yet solved. A closer cooperation of workers in this field is necessary. Published information should be exchanged freely and problems discussed at frequent joint meetings.
- (ix) The investigation on *Hilsa* should form a permanent part of the research programme of inland fisheries.

f. Mugil

(Recommendation A - 17)

(i) FAO

Mr. J.D. Bromhall of Hong Kong has not been able to complete his review of the biology of this genus, but has offered to make material available to CSIRO, Australia, which organization may prepare a synopsis according to the pattern now being used by Fisheries Biology Branch in its series "FAO Fisheries Biology Synopses".

(ii) Australia

Production continues within the range of fluctuation established in the post-war fishery.

There has been no active research other than routine market measurements, which do not reveal any trend in the composition of the stocks.

(iii) **Ceylon**

(See the report on *Chanos*)

(iv) **India**

The Orissa State Fisheries Department carried out investigations on mullets. Studies on the fishery and biology of *Liza troschelli*, *M. cephalus*, *L. igatroschelli*, *M. tade*, *M. parsia* and *M. corsula* were conducted at the Central Inland Fisheries Research Station, where investigations were directed mainly to the assessment of the fishing dynamics of the various species in the Chilka Lake and the Hooghly estuary. Extensive tagging operations in the Chilka Lake revealed that *M. cephalus* and *L. troschelli* migrate to the sea from the Lake for spawning. The Central Marine Fisheries Research Station also conducted investigations on the biology of *M. cephalus*, and *L. macrolepis* from a lagoon near Balk Bay.

(v) **Korea**

A preliminary report on the artificial culture of mullet (*Mugil* sp.) in Korea which included observations on the spawning grounds and an account of the fish's gross embryology was submitted as a Technical Paper to the 9th Session. (IPFC/C61/TECH 33)

g. Shrimps

FAO has reported to the Government of Indonesia on the results of, and requirements for marine biological research on shrimp stocks (T.H. Butler, 1959. Report FAO/ETAP (1057)).

h. Pearl Molluscs

FAO has reported to the Government of India on a survey of pearl and chank beds in the Gulf of Manaar (F. Baschieri-Salvadori, 1960. Report FAO/ETAP (1119)). Dr. Baschieri has spent a further two months in India (November-December 1960) to continue his survey and training program.

3. RESEARCH, INCLUDING DEVELOPMENT OF METHODOLOGY AND TECHNIQUES, ON CERTAIN SPECIALIZED SUBJECTS RELATING TO FISHERIES

a. Standardization of plankton nets

(Recommendations Nos. A-4, B-4, C-8)

(i) **FAO**

Nets obtained through funds supplied by UNESCO were distributed to member countries undertaking comparative trials with Marutoku and other types of samplers. The terms of the agreement require that the IPFC should report to UNESCO not later than December 1960 on the use of the donated nets. FAO has not yet been able to make available prototypes of the modified Hardy Plankton Indicator.

(ii) **Australia**

CSIRO has continued to use the modified Charke-Bumpus net for routine zooplankton work and is satisfied with its performance. A standard net as advocated by the IPFC committee has been received and compared with the Clarke-Bumpus. This testing has been delayed by the absence of the divisional planktologist overseas for nine months.

Comparative samples were taken with the regular weekly zooplankton samples at the Jibbon 100 metres station. The dates of sampling are listed in the following table.

On one occasion (23/3/60) the net came up full of sand; no repeat sample was taken. On another occasion (26/6/60) the net came up holed. On other dates rough seas prevented the regular weekly sampling.

The technique adopted was to take an oblique sample from a depth of 100 meters to the surface, the Marutoku-B net being placed directly beneath an open Clarke-Bumpus sampler, on the same wire. The two nets thus traversed approximately the same water masses.

The towing speed was about $1\frac{1}{2}$ knots with a wire recovery rate of $3\frac{1}{2}$ meters per minute producing a filtering time of half an hour.

Time of sampling was between 1100 hours and 1200 hours on the dates listed.

After extraction of $\frac{1}{10}$ for classification the remaining $\frac{9}{10}$ of the sample was subjected to wet weight and dry weight determinations. The results of these determinations are listed in the attached table.

The wet weights were determined by placing the catch in a crucible having a gauze bottom

and blotting it dry. The catch was then washed with 70% alcohol and again blotted. This procedure was repeated at least three times thus replacing the interstitial water with alcohol. After most of the alcohol had evaporated the catch was weighed.

The dry weights were determined after dessication in an oven for 24 hours at 80°C.

Date	Marutoku		Clarke-Bumpus	
	Wet Weight (mg/m ³)	Dry Weight (mg/m ³)	Wet Weight (mg/m ³)	Dry Weight (mg/m ³)
4.2.60	57	5.04	48	5.04
24.2.60	78	8.60	151	16.5
23.3.60	120	8.28	25	3.64
14.4.60	112	3.58	149	13.1
21.4.60	22	2.16	23	2.90
28.4.60	32	4.33	50	6.07
5.5.60	33	3.34	27	3.32
10.5.60	110	11.1	159	14.7
25.5.60	71	6.46	81	7.57
9.6.60	108	10.3	144	14.3
16.6.60	43	4.86	67	6.82

(iii) Ceylon

The Marutoku-B net arrived in Ceylon in November 1959 but it was not possible to conduct experiments with it until October 1960.

A set of experiments using the Marutoku-B net and the 45 cm. net with No. 0 mesh has been completed. A preliminary report on these experiments was submitted to the 9th Session of the IPFC (IPFC/C61/WP 42).

Prior to the arrival of the Marutoku-B net some vertical hauls had been made with two 45 cm. diameter nets having mesh sizes of No. 00 and No. 0, respectively.

(iv) France

Comparative trials with the Marutoku-B net and a $\frac{1}{2}$ -meter net have been made, and the results will appear at a later date.

* A complete set of equipment and documents was sent to India in August 1959. Later circulars elicited no response. Sec.

** A letter, asking if the equipment should be sent, was sent to Indonesia on 27 August 1959. No reply was received. Sec.

(v) India

Experiments are in progress at the Central Inland Fisheries Research Station to devise suitable nets for plankton studies in impounded waters. The problem of assessing correctly the plankton population in impounded waters by suitable sampling methods is also under careful study. The Central Marine Fisheries Research Station has requested a Marutoku-B type net, with instructions from the IPFC for commencing these trials. (Net not yet received)*

(vi) Indonesia

The Marutoku-B type standard plankton net had not yet been received.**

(vii) Japan

In 1943, a net designed by Z. Nakai and called the Marutoku-A type was employed for a

Survey program carried out by about ten research boats in the Japan Sea.

Later in 1949 when an investigation programme for important neritic pelagic fish was commenced on a country-wide scale with an emphasis upon sardine fisheries, the A-type net was designated as the standard net for spawning surveys. A duty of the net was to collect eggs and larvae of sardines, anchovies, mackerels and macroplankton in general. While other models of nets, in addition to the A-type, were occasionally employed for various needs relevant to the investigation programme, it remained in service until 1953 when the upper cylindrical section with the 3 cm. mesh was removed in order to mount a flowmeter in the mouth opening. The net thus modified came into existence as a new standard net named Marutoku-B type alias Improved Marutoku Net.

In 1958, the B-type net was used by 62 research boats of Regional Laboratories or Prefectural Experimental Stations which participated in the above-mentioned investigation of fisheries resources. The number of collections carried out with the B-type net reached 7,142 that year, excluding other cases where the net was also on duty. Frequency of the service in 1959 was nearly the same as the previous year.

During international oceanographic observations in the North Pacific (NORPAC) carried out by Canada, Japan and the United States in 1955, the B-type net was adopted as a standard gear for collecting macroplankton by Japanese participating agencies (NORPAC Data, 1960, p.xxx). The methodological standardization of the NORPAC recommends the wet weight measurement for treating materials collected by the B-type net.

The following procedure for taking and preparing the samples was recommended:

- a) Use of Net: Mouth Diameter 45 cm., width of apertures 0.33 mm., with a flowmeter, to be hauled up vertically at the rate of 1 m/s from a depth reached by the length of wire of 150 m.

- b) Treatment of Samples: Use 10 per cent formalin for preservation, and wet weight for the quantitative determination. Each sample is to be weighed after removing water off the surface of organisms by filter paper. However, particular organisms including Coelenterata with no umbrella, *Salpa Pterotrachea*, and *Pyrosoma* whose longest dimension is greater than 1 cm. will be removed from the sample. Some other species of Coelenterata having an umbrella are also removed when the diameter of the umbrella exceeds that limit. The names of organisms removed should be recorded.

Other organisms which are especially large in size should be recorded, after weighing the sample, as to the names of species, number of individuals, and weight. The weight of the sample is expressed in grams per cubic meter of water adjusted by the amount of water strained.

For further details see Nakai, Z. (1942): The chemical composition, volume weight and size of the important marine plankton, *J. Oceanog. Soc. Japan*, Vol. I. Nos. 1-2, pp. 35-45, English translation (1955), *Special Pub. No. 5, Tokai Reg. Fish. Res. Lab.*, pp. 12-24.

As this procedure is almost identical to that used in the cooperative fisheries investigation referred to above, it can be stated that quantitative determination of plankton has been essentially standardized by the wet weight as far as Japan is concerned. In this respect, one should avoid drawing a hasty conclusion as to which assessment be adopted in every case, displacement volume or wet weight. However, according to a technical paper prepared for the 9th Session of the Council (IPFC/C61/TECH 20), it has been observed that the wet weight is capable of measuring plankton samples more precisely and more easily than the displacement

volume at least where macroplankton is dealt with. It is hoped that further effort should be paid to finding a better standard method for routine work pertinent to planktonology.

(iii) Korea

Oceanographic surveys by the Marine Research Section of the Central Fisheries Experimental Station have employed a 60-cm. vertical plankton net and a 130-cm. surface net.

In 1960, a Marutoku-B type plankton net was substituted for the vertical plankton net. However, comparative experiments have not yet been carried out.

(iv) Malaya

One comparative experiment was conducted with the Marutoku-B net and the Clarke-Bumpus sampler, and another with the Marutoku-B net and the North Pacific net. Methods followed those in Annex 2 of Extract from the Summary Report of the 8th Session IPFC, Colombo, 1958 (pp. 57-58). A report on the experiments was submitted to the 9th Session. (IPFC/C61/WP 29)

It was recommended that these comparative studies be made with special reference to fish eggs and larvae, but it was observed that during the experiments in offshore waters 20 fathoms or more deep, and on the Rastrelliger fishing grounds of comparable depth, fish eggs and larvae were rarely found.

Fish eggs and larvae were found in greater numbers closer inshore where vertical hauls were not practicable. For inshore plankton experiments horizontal hauls would be necessary. The Clarke-Bumpus sampler should prove invaluable for this type of haul, for the depth of the water allows the use of small craft only, from which larger nets in shallow waters cannot be worked satisfactorily.

For routine plankton investigations on the Rastrelliger Fishery, North Pacific Standard Nets of Nylon Cloth xx13 and GG 54 (Japanese Standard) are being used.

(v) Philippines

The Marutoku-B plankton net and Hensen egg net have been used since 1958.

A comparison of the density of catches of these two nets at Stations B and D from November 1958 to January 1960 by using the displacement method of volume determination showed that there was no significant difference in using the Hensen egg net as compared to the Marutoku-B net. Inasmuch as the latter is much smaller and because of the ease of handling, consideration on the advisability of concentrating on the use of the Marutoku-B net is sought. The results of this study were reported at the 9th Session. (IPFC/C61/TECH 30)

The investigations on the distribution of plankton are made with special regard to the fluctuations in the availability of food organisms to the fish stocks and the distribution of fish eggs and fish larvae in and near Manila Bay.

During monthly field trips in Manila Bay, these vertical hauls with a Hensen egg net and Marutoku-B and 10-minute horizontal drags with a larval ring trawl were made at each of the five standard stations occupied. These samples were sorted roughly and the components determined. Similar study was extended to the San Miguel area and samples were systematically taken at three fixed stations, which were occupied once every three months.

Analysis of samples by animal type and number was made from Stations B in Manila Bay and D outside the Bay for comparison of catches during the first year and is being continued. Samples of plankton materials were taken to England for verification by the assistant on planktonology who underwent training there under the Colombo Plan.

Based on the vertical tow nets made at Stations A, B and C from April 1957 to March 1958, it has been observed that catches were highest in the center of the Bay at Station B, followed by Station A, indicating a greater abundance of plankton inside the Bay than outside by a ratio of 2 to 1.

It was observed that there is more phytoplankton in the shallower parts of the Bay, and that zooplankton is more abundant inside the Bay.

Although it is not yet possible to detect the real correlation between the plankton abundance and abundance of fish stocks in the Bay due to lack of accuracy in the fish catch statistics, it seems that the rich phytoplankton bloom of June 1957 gave rise to the bloom of copepods, an important food item which was observed abundantly in the following months; likewise, it was observed that the fish catches then were generally better than in the previous months.

(vi) **Thailand and Vietnam**

The 45 cm. Marutoku-B net was used on the "Naga" expedition (Report by Dr. E. Brinton, Annex D). A second, new net was made avail-

able in August, and parallel *oblique* tows were to be undertaken; a report on the results is awaited.

(vii) **U.K. (Hong Kong)**

No tests were made as the research vessels were not operating.

(viii) **United States (Hawaii)**

A comparison of the Marutoku-B 45 cm. net with the meter net used by the Honolulu Biological Laboratory was made by towing both nets simultaneously on the same cable. Some six comparative tows were made.

The table below gives the comparative catches based on counts of selected groups of organisms, both on the basis of the average absolute numbers taken and the average numbers taken per 1,000 cubic meters of water strained.

	Meter Net Av. Nos.	45-cm. Net Av. Nos.	Meter Net Av. Nos.	45-cm. Net Av. Nos.
Foraminefera	450	1805	292	7080
Siphonophera	2790	505	1865	1938
Chaetognatha	6490	1785	4293	7018
Calanoida	33590	11700	22417	45795
Cyclopoida	1510	3130	1002	11978
Ostracoda	1030	495	692	1822
Euphausiaces	3190	760	2150	2918
Amphipoda	3190	335	2216	1310
Shrimps	760	50	520	187
Crustacean Larvae	150	190	97	715
Pteropoda	1030	325	694	1192
Heteropoda	280	135	191	530
Appendicularia	120	745	79	2976
Fish Larvae	410	60	270	215

Some differences between the two nets are apparent in the counts and require discussion. The Marutoku-B 45-cm. net took a relatively, and in some instances an absolutely, greater number of some of the smaller organisms. This may be due to certain differences in the mesh of the netting employed; the Marutoku-B net was entirely of a 0.308 nitex while the body of

the meter net was of 0.656 nitex and the cod end of 0.308 nitex.

The meter net captured, on an absolute basis, almost seven times the number of fish larvae, an important consideration if one of the major objectives is to ascertain the distributional patterns and abundance of larval fishes. To put the matter in another way, if an hour's haul with

the meter net would provide an adequate sample, the Marutoku-B net would require a seven-hour haul.

It may be suggested that if the mesh size and patterns of use were identical for both nets, reasonably accurate comparisons of hauls could be made by metering the flow of water and computing catches on the basis of volumes or numbers per 1000 cubic meters of water strained.

b. Identification of fish and plankton

(*Recommendation Nos. A-5, B-5*)

(i) FAO

An alphabetical list of common names of fish has been prepared by Fisheries Biology Branch, Fisheries Division, FAO. This should be available at least in draft during 1961.

The taxonomic code used in bibliographic work has been published in Volume 3(1) of "Current Bibliography for Aquatic Sciences and Fisheries", down to families. It is hoped to publish it down to genera and species when it has been reviewed by a competent taxonomist.

The General Fisheries Council for the Mediterranean has published a Catalogue of Mediterranean Fish Names. On each sheet of this catalogue is given an illustration of a fish species, scientific and vernacular names, and some biological information.

(ii) Australia

Mr. I.S.R. Munro is at present engaged in producing a Handbook on the Fishes of New Guinea and also a series, Handbook of Australian Fishes, is being published in the Australian Fisheries Newsletter. A Committee of Australian fish taxonomists has been formed to help make this work authoritative. Mr. E.J.F. Wood has contributed several papers during the past year on the diatoms of Australia and New Zealand. His papers have been published mainly in New Zealand. Mr. D.J. Tranter has been engaged in identification of the copepods of the Australian coastal plankton. The Curator of Fishes of the Western Australian Museum is carrying out a detailed revision of the fishes of

Western Australia. The curators of fishes in the other Australian museums and the government ichthyologist, Queensland, have continued routine identification of fishes submitted.

The CSIRO planktologist has been overseas for nine months making a study of copepod systematics.

(iii) Burma

A list of lake plankton has been issued as IPFC Occasional Paper 59/4 by the Secretary.

(iv) Ceylon

Several scientists have worked on the fish fauna. Complete and comprehensive accounts are available in the following publications:

1. Deraniyagala, P.E.P. 1952. A Coloured Atlas of Some Vertebrates of Ceylon, Vol. I. Fishes. Ceylon National Museums Publication.
2. Mendis, A.S., 1954. Fishes of Ceylon. Bull. No. 2. Fish. Res. Sta. Ceylon.
3. Munro, I.S.R. 1955. The Marine and Freshwater Fishes of Ceylon. Canberra, Australia.

Since the above publications were issued, Deraniyagala has added a few more species. These are reported in *Spolia Zeylanica*, Vol. 28, pp. 129-138, 1958.

A few other new records for the area have accumulated in the Research Station. Studies on these fish will be reported in due course.

Work on the collection and identification of marine phytoplankton commenced in 1960. Qualitative analysis of zooplankton is also underway and it is intended to prepare check lists of the major zooplanktonic forms.

Regarding the identification of freshwater plankton no work has been done in recent years. A Bulletin of the Fisheries Research Station which includes a listing of the hitherto recorded species of freshwater zooplankton of Ceylon is in preparation and will be issued shortly.

(v) **France**

Les identifications du zooplancton n'ont porté que sur la détermination, en vue de comptages, des grands groupes zoologiques (Copépods, Foraminifères, etc.). Il est envisagé de passer dans les mois à venir à un travail plus précis.

Par centre, en 1960, des prélèvements qualitatifs de phytoplancton furent faits tous les 30 milles au cours de deux croisières. L'une d'elles était spécialement importante fournissant des données sur une sire largement répartie de Nouméa aux îles Salomon. Il y fut 71 espèces de Dinoflagellés et 24 espèces de Diatomées, avec une moyenne par station de 22 espèces de Dinoflagellés, dont 14 *Ceratium*, et de 4 espèces de Diatomées. La répartition de ces espèces ne fait pas apparaître une différence nette, sauf pour trois stations proches des Solomon où les espèces de Diatomées parurent prendre la place des Dinoflagellée.

Des prélèvements faits dans le lagon de Nouméa à une passe cituée à 12 milles de la ville, montrent moins d'espèces en Mai qu'en Juillet et, contrairement à ce qui est dit ci-dessus, une prédominance des Diatomées sur les Dinoflagellés de plus en plus accusée en s'approchant de terre, les apports urbains pouvant être mis en cause pour expliquer ce fait.

(iv) **India**

A considerable volume of published work exists and descriptions and keys to the identification of most of the species of fish are available. The Zoological Survey of India, where work on the systematics of fishes is done has, in recent years, published several check lists of fishes and others are under preparation.

As regards plankton, work is being done at the Central Inland Fisheries Research Station mainly on copepods, rotifers, blue green algae, and diatoms. Publications on these subjects are under preparation.

During a survey of the Brahmaputra river system in Assam a large number of fishes were collected and identified. A paper is under publica-

tion on this subject. Critical identification of all of the plankton of the Chilka lake was carried out during the period. A detailed systematic study of the fresh water copepods was conducted. Two monographs on the phytoplankton of the west coast of India were published by Dr. R. Subrahmanyam.

A preliminary list of the fishes of Rajasthan has been issued as IPFC Occasional Paper 60/2.

(vii) **Indonesia**

Surface plankton from 70 stations was collected by the research vessel SAMUDRA during her Java sea cruise (May 1960). Identification is in progress.

A list of commercial fishes has been issued as IPFC Occasional Paper 59/1.

(viii) **Korea**

A paper listing the species of phyto- and zooplankton collected from the East, South and Yellow Seas adjacent to Korea during the period of 1930-1960 was submitted to the 9th Session of IPFC. (IPFC/C61/WP 31)

(ix) **Malaya**

Mr. J.S. Scott has completed a Handbook on the Marine and Estuarine Fishes of Malaya, especially those of the East Coast.

Although plankton work is being conducted in conjunction with the Rastrelliger fisheries, the samples are being analysed only for abundance, and identification is only to genus.

(x) **Pakistan**

Dr. Nazir has published a list of the freshwater fishes and some marine fishes of East Pakistan in his paper "Fish fauna of East Pakistan" (Pakistan Journal of Science No. 5, Vol. 5 No. 1, 53). Miss Anwara Bugum of East Pakistan, has studied the plankton of freshwater ponds of Dacca and published "A short note on plankton of freshwater ponds of Dacca" (Agricultural Pakistan Vol. IX No. 4, 1958, pp. 370-392).

(xi) **Philippines**

A checklist of Philippine Fishes by Dr. A.W. Herre, U.S. Fish and Wildlife Research Report 20 (1953) and "English and Local Common Names of Philippine Fishes" by Herre and Umali (U.S. Fish and Wildlife Circular 14, 1948) are available.

At the moment a review is in progress of the identification of the different species of fish whose life histories are being worked out under the marine fisheries biological research program. Of the slipmouths, 17 species have been found present; of the anchovies, 9 species; of the chub mackerels, 4 species; of the roundsad, 2 species; of the sardines, 4 to 5 species; of the flatfishes, 4 to 5 species; of the croakers, 2 species; of the cutlass fish, 1 specie; of the pomadasys, 2 species, and of the shrimps, 5 species.

The identification of these fishes being studied are reviewed critically based on morphometric characteristics. Racial differentiation is also being looked into.

Plankton identification charts are being prepared for local use. Studies on the identification of fish larvae have been started and the hatching of fish eggs from plankton hauls is being studied.

(xii) **U.S.A. (Hawaii)**

A preliminary bibliography on plankton identification has been submitted in response to the IPFC request, and has been recommended for publication as an IPFC Occasional Paper.

A manual for the identification of Hawaiian fishes is in press at the University of Hawaii Press.

A short bibliography of papers recently published or in press, which would be useful for the identification of fish and plankton in this area, was submitted, and recommended for publication as an IPFC Occasional Paper.

Dr. Donald Strasburg has undertaken a study of differentiation within the *Istiblennius edentulus* species complex; this group of fish being selected because of the convenient size and

character of its members. Attention has been focused on variations in the number of fin rays produced by water temperature, amount of insolation or rainfall, sexual dimorphism, and interaction between adjacent fins.

Published descriptions are available for many of the larvae of tunas. However, the larvae of albacore, *Thunnus alalunga* (Bonnaterre), the bigeye tuna, *Parathunnus sibi* (Temminck and Schlegel), the northern bluefin tuna, *Kishinolla tonggol* Bleeker, and the Japanese bluefin, *Thunnus orientalis* (Temminck and Schlegel) have not been identified. The first two species mentioned are of major concern in the central Pacific area; the latter two are rare in this area but are important along the Pacific coast of Asia. The identification of the larvae of these species has been made on a tentative basis through the study of plankton collections taken by the DANA by Mr. Walter Matsumoto, scientist of the Honolulu Biological Laboratory of the Bureau of Commercial Fisheries.

During the period beginning in July and through the first part of August 1960, the research vessel CHARLES H. GILBERT explored a portion of the western Pacific suspected of being a spawning area for albacore. The westernmost part of this area was also covered by the SHUNYO MARU, a fisheries research vessel of the Nankai Regional Fisheries Research Laboratory of Kichi, Japan. In the plankton catches made from the CHARLES H. GILBERT were a small number of larval tunas which Mr. Matsumoto tentatively identified as larval albacore and bigeye on the basis of his work with the DANA material. They were present in about equal numbers in those catches made west of longitude 180°.

The concern of fisheries scientists must be with the stock or population of fish being exploited. The problem of delineating tuna stocks has been an extremely difficult one and has largely been attempted by studies of the morphometrics of fish from various areas. Recently the Bureau of Commercial Fisheries in Honolulu has attempted to delineate tuna stocks by the use of blood group techniques, a method which the Nankai Laboratory in Japan has successfully employed for albacore and which is being inves-

tigated by the Inter-American Tropical Tuna Commission. This work is just beginning, but considerable progress has been made with skipjack from Hawaiian waters. Available for the tests are some six reagents, some of which have been developed from the blood of other animals through immunological procedures and others are extracts from the seeds of leguminous plants. In addition to the substantial progress made in the characterizing of Hawaiian skipjack stocks through these tests, at least one or another of the six reagents were found suitable for the detection of individual differences in albacore, bigeye and yellowfin tunas. A method of preserving albacore and bigeye erythrocytes has been developed which will keep the erythrocytes from 4 to 6 months and make possible the shipment of blood samples in satisfactory condition for tests even by surface vessels throughout the Pacific.

The CHARLES H. GILBERT made a voyage from Honolulu to the Line, Marquesas and Society Islands primarily for the purpose of obtaining blood samples from tuna stocks in these areas for comparative study with those of the Hawaiian area.

(xiii) Vietnam

During a stay of one year in Vietnam, Dr. Katsuzo Kuronuma assembled a list of almost 700 names of autochthonous fishes. This list has been compiled in three languages (Vietnamese, Japanese and English). It will be communicated to the Council.

c. Population dynamics

(*Recommendation No. A-6*)

(i) FAO

Report of the Joint Scientific Meeting of ICNAF/ICES/FAO in Lisbon, 1957, has now been published, and copies were available at 9th IPFC Session as a Contributed Paper. The Second Volume of Proceedings, containing texts of papers, is still being edited for publication in 1961. A multilingual notation for fishery dynamics was published in English, Japanese and German in the Journal of the ICES. Terms in

20 languages, including many others used in the Indo-Pacific region (e.g., Malay, Indonesian, French) are being published in the FAO "Fisheries Study" series (in the press, November 1960).

It now seems likely that the proposed International Journal on population dynamics will not be started until 1961 or later. An editorial board has however been formed, and question of format, etc. are being examined.

An analysis was made of comparative population parameters of sardine species and was presented at the FAO meeting on Sardine Biology, 1959. A general note on comparative studies was presented to a symposium of the British Ecological Society early in 1960; this will be published by the Society. (see "Age determination").

No further progress has been made with the Manual on Sampling, by J.A. Gulland, which is still in rough draft.

In conformity with its programme of work, the Fisheries Division has begun to prepare for an Expert Meeting on the Economic Effects of Fishery Regulation to be held in Ottawa, 1961. A fishery economist, Professor Anthony Scott, and a fishery biologist, Dr. L.M. Dickie, have each been asked to prepare a basic paper, and these will be supplemented by a number of case study papers. It is expected that the discussions will be of primary interest to administrators and economists, but it is hoped that there will also be some participation from the ranks of biologists.

The Biology Branch has also begun preparatory work for a future expert meeting on the prediction and verification of biological effects of regulations.

(ii) Ceylon

Statistics of the trawler catches have been tabulated but it has not been possible to analyse the data as yet. A start has been made on the study of the stock of the Indian mackerel present around Ceylon.

No work in the field of population dynamics has yet been undertaken with respect to inland fisheries.

(iii) **India**

Considerable work has been done at the Central Marine Fisheries Research Station and Central Inland Fisheries Research Station on the population dynamics of several commercially important fishes particularly mackerel, sardines, major carps, catfisher and *Hilsa* and other riverine and estuarine species.

Primary data regarding recruitment, growth and mortality required for the construction of population models were also collected. Data on total catch and catch-per-unit-of-effort from different river systems and estuaries were collected. An intensive tagging programme was undertaken in regard to several species of fishes in the Chilka lake and *Hilsa*. The programme of studies covered over 32 species of economically important fishes and prawns.

(iv) **Japan**

As has been described on a previous occasion (IPFC, 8th Session, Proceedings, Section I, p. 30, 1958), work on population dynamics of important marine fish has been continued mainly by Regional Research Laboratories and research institutions of universities. Fish dealt with include herring, sardine, anchovy, salmon, Pacific saury, tunas, skipjack, mackerel, horse mackerel, croakers, cod, Alaska pollack, flat fish and common squid.

(v) **Korea**

Work concerning population dynamics as well as a large number of other studies upon commercially important species was described in a paper presented at the 9th Session. (IPFC/C61/WP 31)

(vi) **Malaya**

Relevant data at present being collected only for *Rastrelliger* fisheries because of staff limitations.

(vii) **Philippines**

Work on the availability of fish stocks is being done, but the assessment of yields and

intensity of fishing cannot yet be made due to the many problems that beset the fishery. The detailed sorting by species of Philippine catches is not possible because of the presence of about 100 different species representing more than 30 families. The absence of definite growth rings on skeletal features makes it almost impossible to determine the growth rate which is indispensable for analysis and production techniques.

(viii) **U.S.A. (Hawaii)**

Two studies on population dynamics were made, one of which has been published and one of which is not yet complete.

The first, by Dr. Robert Riffenburgh, mathematical statistician of the Honolulu Biological Laboratory, Bureau of Commercial Fisheries, provides a mathematical model for the flow of energy or weight in a community of plants and animals.

Secondly, Mr. John C. Marr has studied the random fluctuations of a series of reproductive curves. A series of population models have been erected with the intent of determining if the assumptions made could actually exist in nature as opposed to models whose assumptions are accepted as realistic. Population in year class sizes through 200 generations were calculated on the basis of five reproductive curves, modified by a series of random factors and subjected to four different mortality rates. The unreality of some of the reproductive curves was demonstrated by a tendency for the population to become infinitely large at low mortality rates and to become extinct at high mortality rates.

d. Age determination

(Recommendation Nos. A-3, B-3)

(i) **FAO**

Progress has been slow in preparing a review of methods and applications of age determinations, but during the inter-sessional period FAO has participated in devising methods of fishery assessment which do not depend on the ability to determine the absolute ages of fish in samples. An efficient method of estimating growth parameters, first worked out during the

Rastrelliger Training Centre has been published [J.A. Gulland and S.J. Holt (1959), *J. Cons. Int. Expl. Mer.*, 25(1): 47-9] and was available at the 9th IPFC Session as a Contributed Paper. Another relevant contribution is mentioned under "Population dynamics". J.A. Gulland is publishing in 1961 a paper describing a method of assessing the effects of changes in mesh size using length frequency distributions for catches and not relying critically on age determination. Work is in progress on a complementary method of predicting the effects on catches of changes in fishing effort. A summary review of these methods will be submitted by FAO to the IPFC at an appropriate time.

(ii) India

Investigations are being carried out at the Central Inland Fisheries Research Station by using hard parts such as scales, otoliths, opercular bones, vertebrae and spines. Results so far indicate that in certain species scales are valid indices of growth and age (e.g., *Mugil tade*, *M. parsis*, *Cynoglossus semifasciatus*, *Cirrhina mrigala*, etc.) and in others they are not useful, e.g. *Hilsa*. In some cases where scales were found useful it was ascertained that the checks are laid on the scales each year and the causative factor appeared to be flooding of the rivers and consequent changes in the ecological conditions due to monsoons. The use of spines for the determination of age of catfishes (*Mystus gulio*, *M. aor* and *Pangasius pangasius*) shows promise. An inexpensive nylon tag is also being used to study some aspects of the biology and migration of *Hilsa*.

(iii) Philippines

Age determination by the Petersen method is being done on all species under study, and one paper has been submitted for publication, on the availability by size groups and species of slipmouths in Manila Bay and San Miguel Bay.

(iv) U.S.A. (Hawaii)

Some work has been done with age and growth, as determined by tagging, for skipjack, *Katsuwonus pelamis*. The results of this work

are being analysed. Also see: Otsu and Uchida (1959). Study of age determination of hard parts of albacore from Central North Pacific and Hawaiian waters. U.S. Fish and Wildlife Service-Fish. Bull., 59 (150): 353-363.

e. Fish behaviour

(i) FAO

The report and papers of the Symposium in Colombo 1958, have been printed and distributed as Section III, IPFC 8th Proceedings. The Secretary has published a bibliography of this subject as IPFC Occasional Paper 60/4.

f. Oceanography

(Recommendations Nos. C-10, C-12)

(i) FAO

FAO has participated in and represented the IPFC at the Inter-governmental Conference on Oceanographic Research convened in Copenhagen in 1960 by UNESCO, and endeavoured to keep fisheries problems in the forefront in the discussion of the coordination of oceanographic studies by countries and by various international agencies concerned. Two papers were prepared, one of which describes the intelligence services established by FAO for fisheries oceanographic purposes.

As a result of the Copenhagen meeting, UNESCO has established an Office of Oceanography within its Natural Sciences Department, which will service an International Oceanographic Commission as well as conduct the rest of that Agency's programme in the Marine Sciences. This latter programme will be concerned primarily with training. At the suggestion of FAO, the Administrative Coordinating Committee (ACC) of the U.N. has established, at secretarial level, a sub-committee on oceanography which will coordinate the activities of the interested agencies (UNESCO, FAO, WMO, IAEA and IMCO) within their established programmes of work.

The FAO Council also proposed to UNESCO that a joint policy committee (at Government level) be established by these two agencies

primarily concerned. This proposal was referred by the UNESCO General Conference in Paris, November 1960, to the Executive Board for its further consideration.

The American Geographical Society, working with a panel set up by the Committee on Oceanography of the U.S. National Academy of Science—National Research Council, proposes to publish a scientific journal of an unusual kind, with the title “Serial Atlas of the Marine Environment, North Atlantic (A Geographical Journal of Biological and Physical Oceanography)”. It will consist of maps, accompanied by any necessary explanatory text and will appear irregularly as contributions are received and accepted. It will be a medium for publication of studies of all kinds—biological, geological, physical, chemical—that will increase understanding of the marine environment. Initially, it will be limited in scope to the Atlantic from the Equator to the North Pole, including the Arctic basin and the Mediterranean but may eventually be extended to world coverage. Production of work sheets (1:300,000 scale) has begun based on a specially prepared oblique stereographic azimuthal projection, an equal area projection especially suitable for plotting currents, etc.

Scientists who contribute to the journal will be able to obtain the work sheets at nominal cost from the American Geographical Society. There will be some systematic submission of material, for example, by FAO according to its pattern for Oceanic Synopses, but any contributions to the subject will be welcomed, provided of course they conform with the editorial policy to be established by the Committee, and will be subject to editing by professional cartographers.

The atlas will be published in sheets 24 × 15 inches and will be available in two editions—one opaque and the other transparent, perhaps on film to facilitate comparative studies—and may also be issued on microcards. It is believed that the new journal will meet a growing need in the study of the environment and of marine organisms and will offer a ready and standard means of recording and comparing distribution.

Compiling and plotting the distribution of as many variables as possible will permit a broad approach to problems of spatial and temporal correlations and may uncover critical areas towards which new research efforts may be directed. The journal will also offer marine biologists a means of publishing material gathered incidentally in the course of their investigations that might otherwise stand little chance of being recorded.

The plan is sponsored in the United States by the National Academy of Sciences—National Research Council, and in Canada by the Royal Society of Canada. Funds are being sought in both countries. The panel is international, and consists at present of M.J. Dunbar (chairman), Lionel A. Walford (Secretary), Charles B. Hitchcock, C. O'D. Iselin, Ernest Thompson, C.S. Pittendrigh, T.W.M. Cameron and H.H. Hess. Sidney J. Holt represents FAO on this panel, and is provisionally acting as European editor.

FAO is collaborating with the sponsors of the Serial Atlas by submitting also for publication in it, synopses of oceanographic data being prepared as part of its project for a World Fisheries atlas and in adopting for its own use and encouraging adoption, for similar purposes, by other organisations, of the new base maps.

FAO, in association with the U.S. Office of Naval Research, the American Institute of Biological Sciences and the American Geographical Society proposed to convene at Rome, probably in January 1962, a small expert meeting on Marine Biogeography. It would last about five days; its main purposes being:

- a) to make proposals for coordinating the activities of the several bodies concerned with the biogeography of the North Atlantic.
- b) to discuss the content, arrangement and support for the Serial Atlas described above.
- c) to discuss plans and preparations for a World Scientific Meeting on the Geography of the Marine Environment at some future date.

For several years Fisheries Biology Branch has been developing the basis and methods for the preparation of summaries of oceanographic and fisheries information for certain marine areas. These summaries consist of text, tables and charts and, as mentioned above, it is now proposed to publish certain of these in the new Serial Atlas. It has been the intention of FAO eventually to compile the charts into a world atlas in loose leaf form, and now this project will be developed in close collaboration with the new Serial Atlas, to avoid any overlap if the scope of the latter is extended to cover more than the North Atlantic area.

FAO has earlier prepared draft synopses for the Gulf of Mexico and Caribbean, West Coast of Africa, Mediterranean and, most recently the East Coast of Africa and the Central Indian Ocean (in connection with a CCTA/CSA fisheries meeting in Cape Town held in 1960, and the Indian Ocean Project of SCOR). The Biology Branch has now had the advantage of the advice of Professor Hela of Finland, who proposed an outline for future synopses, and who further suggested that this be put to the test in an attempt to make a synopses for the North Sea.

The result of this attempt was presented to ICES for consideration at its last Meeting, and that Council arranged for this draft to be reviewed during the next few months so that a corrected and authoritative version may be offered for publication in the new Serial Atlas. Those parts of the Oceanographic Synopses concerned with climatology and meteorology will in the future be prepared in collaboration with WMO.

(ii) Australia

In fisheries oceanography, work has continued on the study of the association of tuna occurrences with "fronts" between water masses.

(iii) Ceylon

Records of surface temperature and salinity data from inshore waters are being gathered.

A programme of regular sampling of off-shore surface sea water with the help of government fishing vessels has recently been initiated.

An oceanographic and plankton survey of Puttalam lagoon is being carried out. This survey includes the determination of: oxygen, carbon dioxide, salinity, chlorinity, pH, nitrates, phosphates, silicates and organic matter.

(iv) France (Oceania)

Pendant les années 1958-60, le Centre a exécuté 5 croisières océanographiques dans le nord-est de la mer du Corail: quatre entre la Nouvelle-Calédonie les Chesterfield et les Salomon, une au sud de la Nouvelle-Calédonie jusqu'à l'île Norfolk. En outre quelques croisières d'importance secondaire ont eu lieu dans la région sud le l'île.

Presque toutes ont comporté: des stations hydrologiques jusqu'à 1.200 m. espacées de 60 milles, avec mesures de salinité, température, phosphates, pH, carbonates, oxygène;

— des stations production primaire jusqu'à 100 m. (photosynthèse par le C 14, mesures de pigments); certaines mesures étaient faites toutes les 6 heures;

— des stations zooplancton quantitatif tous les 30 ou 40 milles par trait oblique au filet de 0 m 50, de 0 à 300.

Un certain nombre de résultats ont déjà adressés au Secrétariat de l'IPFC D'autres en course de publication le seront dès leur parution.

Parmi les recherches de synthèses effectuées au Centre, citons des études sur la relation oxygène—phosphore minéral dissous, la distribution de pH et de l'oxygène, la mouvement des masses d'eau, la comparaison des mesures C 14 par les méthodes de JITS et DOTI, le cycle diurne de production primaire, la répartition régionale de zooplancton par comptage de groupes zoologiques, la variation quantitative diurne du zooplancton.

Au total, furent effectuée en 1958-60:

	1958	1959	1960
Stations hydrologiques	93	53	70
Stations production primaire (C14)	58	38	121
Stations zooplancton quantitatif ..	97		115

Il est trop tôt pour légèrer des conclusions générales. Remarquons cependant que les indications obtenues sur les cycles annuel dans la même région en 1958 et en 1960 divergent profondément.

(v) **India**

Investigations by the Central Marine Fisheries Research Station on seasonal changes in the hydrological features of the inshore and offshore waters of the Arabian sea, were made at different centres along the West coast of the country. An officer participated in the cruise of the Soviet Oceanographic research vessel, VITIAZ. Studies on the primary production of plankton and fish fauna in the equatorial region of the Indian ocean were conducted during this cruise.

Contributions on physical oceanography, marine geology and marine biology, resulting from several oceanographic cruises in the Bay of Bengal, were made by the staff and students of Andhra University, Waltair.

(vi) **Indonesia**

Data collected by the SAMUDRA during her East Sumatra cruise (October-November 1957) which was joined by Dr. Doty of the University of Hawaii, and who is working on the C 14 investigations, were analyzed and sent to Hawaii for further study and publication. Surveys were conducted in the Java Sea and Bali Strait (1958), Indian Ocean (1959) and Java Sea (1960).

These cruises were intended for hydrographical studies and for increasing the number of reference collections of the Institute of Marine Research. A working paper presented to the Oceanographic Conference in New York (1959) was a part of the result obtained from these cruises, especially the Indian Ocean Cruise, west of Sumatra.

(vii) **Japan**

Generally speaking, oceanographical observations have been continued in a manner similar to that reported at the 8th IPFC session (Proceedings, Section I, p. 44) by such institu-

tions as Regional Fisheries Laboratories, Prefectural Experimental Stations, Hydrographic Office, Meteorological Agency and Universities.

During the summer and autumn of 1960 the Kuroshio warm current was found prevalent in the sea off the northeastern Pacific coast of Honshu. The influence of the anomaly of the current in that part of the sea is believed to have been responsible for the poor catch of Pacific saury in the 1960 season which was estimated as being only about one half of the landings (520,000 metric tons) during the previous season.

(viii) **Korea**

The Marine Research Section of the Central Fisheries Experimental Station has been carrying out oceanographic work, the investigation of marine resources, including the study of twelve important species of fish, and the compilation of fisheries statistics.

The Section is divided into six Divisions: Physical, Chemical and Biological Oceanography, Ecology and Physiology of Marine fishes and Fisheries Statistics.

Oceanographic studies in Korea have been made along fixed observational lines and at shore stations. The area of the survey being covered lies along the coast of South Korea, surrounded by the seas on three sides, and from near the coast to a distance of about 120 miles offshore. The oceanographic surveys have been generally carried out at monthly intervals.

The Marine Research Section conducts three oceanographic vessels, the MV TCHAN PA, MV BUKHAN SAN and MV IMKU, operating respectively in the East Sea, South Sea and Yellow Sea.

The oceanographic data are processed in the ships laboratory and the shore laboratory in Pusan, and the results are presented as monthly and annual reports on oceanography and also in individual papers on oceanography.

(A more detailed account was presented in IPFC/C61/WP 31)

(ix) **Malaya**

Investigations are being carried out in conjunction with the Rastrelliger Fisheries Investigations. To begin with they were limited mainly to salinity pattern studies, including oxygen content and hydrogen-ion concentration.

A two-year study of the salinity pattern from Penang to Pulau Angea, off Selangor, has been completed. This is an extension and continuation of the work of Dr. Tham Ah Kow who investigated the salinity pattern from Pulau Angea to Singapore. (The results of this study were submitted to the 9th Session as IPFC/C61/TECH 26).

At present salinity investigations are being extended to cover the area from Penang to the Langkawi Islands to the north, to complete the picture of salinity pattern of the West Coast of Malaya.

(x) **Philippines**

Activities since 1956 were confined to Manila Bay and approaches, where a line of five stations starting from the head of the bay to the entrance were occupied every month. Two stations are within the approaches of the Bay and three are inside the Bay.

Hydrographic data for temperature, salinity, oxygen, pH, phosphate and transparency determinations are collected monthly on special oceanographic trips in connection with special research on water movement, the distribution of plankton, fish eggs and larvae, bottom ecology and primary production.

In addition, a team of two assistants goes with commercial otter trawlers in Manila Bay every two weeks to measure fish on board, collect samples for study; at each station of net hauling, water temperature readings and water samples for nutrients and salinity determination are taken from the surface and bottom water layers.

Further, an experimental small trawl has been operated in Manila Bay for at least four days a week since April 1957.

Hydrographic observation of San Miguel Bay, an important fishing area in Southern Luzon

on the Pacific side, was included in September 1957, and repeatedly surveyed every three months thereafter, for comparison of the conditions obtaining there with Manila Bay.

The data are being compiled and will be used for the interpretation of biological findings.

(xi) **U.S.A. (Hawaii)**

During 1959 the field aspects of the exploratory, oceanographic fishery studies were completed: one in the waters of Northeastern French Oceania, the other in North Central and Eastern Pacific areas. Other activities included participation in the oceanographic programs of the International Geophysical Year (IGY) and a series of cruises in Hawaiian waters to delineate the geographical and seasonal changes in selected oceanographic characteristics of the surface waters. The oceanographic data and descriptive reports resulting from these studies, which were issued or were in press during 1959-60, are listed in Annex E.

Studies in the waters of French Oceania were started in 1956. After two full-scale oceanographic cruises (southern hemisphere summer and winter), surface temperature observations were made, salinity and inorganic phosphate samples were collected and bathythermograph, transparency and water colour observations were made during eight additional fishery cruises, 1956-1959.

Oceanographic studies in the North Central and Eastern Pacific were started in 1954. The various cruises, 1954-59, were planned to delineate the variations in those horizontal and vertical circulation features, and related distribution of properties, which were revealed to be of significance to studies of the distribution and abundance of the albacore tuna.

IGY participation included occupying an oceanographic station each month at a position near the Island of Oahu. Data from the 18-month series, copies of which were forwarded to the World Data centers, will be used in Pacific wide steric level studies. In addition, in cooperation with the Scripps Institution of Oceanography, a study was made of the Equatorial Undercurrent.

By means of direct measurement, this subsurface, easterly flowing current was found to be symmetrically positioned about the Equator between 2°N and 2°S latitudes and between depths of approximately 40 and 300-400 meters. At 140°W the core was at 100 meters with recorded speeds up to 150 cm/sec (3 knots). Average transport was calculated to be $39 \times 10^6 \text{ m}^3/\text{sec}$.

An atlas of the oceanographic climate of the Hawaiian Islands region was completed. As a by-product of this study, a technique for predicting the annual catch of skipjack made by the Hawaiian live-bait fishermen was developed. This prediction is based on the late winter variations in sea surface temperatures as recorded at a monitoring station on the island of Oahu. During 1959, five cruises were made in Hawaiian waters for the purpose of monitoring the changes in the circulation features in order to gain an understanding of the mechanisms involved in the prediction technique, of the oceanographic situation in Hawaiian waters during the season for which the prediction was made, and to provide data more adequately to understand the ocean/skipjack relationships.

A program for punching all meteorological, oceanographic, marine biological and fishery data into IBM cards was started in 1959 and continued in 1960. An IBM 650 electronic computer at the University of Hawaii is available for future studies employing the data on IBM cards.

Plans for future oceanographic studies involve (a) compilation, on IBM cards, of all oceanographic station data from the Pacific and the preparation of average and anomaly charts therefrom, these charts for selected oceanographic parameters of importance to the distribution and abundance of the tuna; (b) cruises planned to yield data for studies of rates and mechanisms of oceanographic and of sea/atmosphere interaction processes.

g. Study of basic productivity

(Recommendation No. A-18)

(i) FAO

The current program of work includes preparation of a handbook reviewing methods and tabulating results of plankton and pro-

ductivity studies. A first draft was prepared by T. Laevastu, 1957. Since then the Fisheries Research Board of Canada has issued Bulletin 122, 1960, by J.D.H. Strickland on this subject, and which incorporates Laevastu's work. The Biology Branch has therefore decided not to proceed with its own review, but rather to help make Strickland's review widely known, including, if possible, arranging for its publication also in French and Spanish. The Government of Canada has kindly made a few copies available for FAO use.

(ii) Australia

During 1959, 12 cruises to study Carbon-dioxide uptake by the Carbon 14 method have taken place in conjunction with the normal hydrological, phytoplankton and plankton pigment measurements.

A description of a method of plankton volume determination has been issued as IPFC Occasional Paper 59/9.

(iii) India

The Central Marine Fisheries Research Station has no facilities at present for using the C-14 technique. Efforts are being made to procure assistance from the International Agency at Copenhagen.

(iv) Japan

An attempt has been made to use radio-phosphorus (P 32) and the red alga, *Porphyra*, to study the productivity of the sea. (An account of this work was submitted as IPFC/C61/TECH 19).

(v) Philippines

In February 1958, research to determine the primary productivity of Philippine waters by radioactive C-14 technique was initiated through the kind cooperation of Dr. Maxwell Doty of the University of Hawaii who was then studying the productivity of marine waters in this part of the Pacific. This study may give indications of the relative fertility of different areas which may help in the proper development of the fish resources of areas not yet adequately developed.

Since then, 69 samples together with 138 control samples in Manila Bay were treated by standard procedure; 33 samples plus 66 control samples from San Miguel Bay were similarly treated. All dried materials are sent to the University of Hawaii for radiation analyses. The data from these analyses will be correlated with other researches on plankton abundance, hydrography and availability of fishes. Since 1959 only one station has been occupied monthly in Manila Bay and one in San Miguel Bay every three months.

Two special collection cruises were undertaken in 1957, one on the eastern side of the Philippines from Manila to Davao, and one on the western side from Manila to Zamboanga.

Preliminary results obtained indicate that the carbon up-take of phytoplankton is astonishingly high in the bay waters. Productivity rates were generally found to be higher in the shallow coastal areas than in the deeper off-shore parts of the bay. This high value correlated with the average fish catch of Manila Bay based on the total catch figure of 7,346 metric tons as given in the Fishery Statistics which is about 543 kgs. per hectare in 1959, one of the highest on record.

(vi) U.S.A. (Hawaii)

This laboratory has used the Carbon-14 technique of Steelman-Nielsen as modified by Doty and Oguri in studying productivity over a wide range of latitudes from 40°N latitude to 20°S latitude.

h. Benthos ecology

(i) Philippines

A benthos survey with a Petersen bottom grab was initiated in Manila Bay to determine the density of animal life on the sea bottom upon receipt of two grabs of 1/10th square meter from FAO-Rome. Research on the benthos biomass in tropical waters is rare and this study may, therefore, fill an important gap in the knowledge of the production biology of tropical water.

In September 1957, 9 stations were selected from a series of 67 stations occupied in previous months. These nine stations were occupied

monthly until June 1958 when the second bottom grab was lost. Three bottom samples were taken from each station, sieved and roughly sorted and analyzed. Similar research was extended to San Miguel Bay where several stations were occupied in September 1957, February and May 1958 and from which 68 samples were analyzed. The following observations were made.

In both areas, the nature of the bottom was classified according to their substratum of grayish mud, greenish mud, sandy mud and sand. In Manila Bay, grayish mud was most productive while in San Miguel Bay the greenish mud zone in the center of the Bay was most productive.

It is believed that the higher productivity of benthos biomass in San Miguel Bay has direct relationship to the more abundant catch of shrimps and flatfishes there than in Manila Bay. Investigations on the food habits of flatfishes have been initiated to determine the food in the area.

i. Trawling studies

[See Proc. Indo-Pacific Fish. Coun., 8 (I): 26, wherein it is recommended that size compositions of catches of main species are recorded in experimental and sometimes in commercial trawling operations]

(i) Philippines

The Marine Fisheries Biological Research Project includes a sampling programme on the catch of otter trawlers in Manila Bay since November 1956. Collaboration has been obtained with fishing boat operators since November 1956 to-date (October 1960). Ninety field trips of 3 to 5 days have been made fortnightly. Two or three assistants participated in the collection of length distributions of the important species under study, the catch composition per haul and collection of fish samples for detailed study. Data on trawling positions and water temperatures and collection of water samples for determination of salinity at each hauling of the trawl net are also made.

A similar investigation in San Miguel Bay, Southern Luzon, gave a reliable catch composition for the area.

Since April 1957 a small trawler, "baby trawl", was operated in the shallower portion of Manila Bay (2 to 8 fathoms) some 255 field trips to May 1960 each lasting a day with a total of 1,389 trawl hauls. The catch is classified in the manner used by the fishermen. A report of FAO Technical Assistance activities in this field has been submitted to the Government of the Philippines (FAO/ETAP Report 1141, 1959).

4. MANAGEMENT OF FISHERY RESOURCES IN NATURAL WATERS (Including Reservoirs)

a. River basin development (*Recommendation No. A-13*)

(i) **FAO**

An FAO document issued in February 1959, entitled "A survey of the investigations required for planning development of agriculture, forests and fisheries in the Lower Mekong River" emphasised the need for surveys of the fisheries resources and the conditions for fish production—especially in the Tonlé Sap and Great Lake area.

(ii) **Ceylon**

The existing river basins which have been developed for agriculture and other purposes have all received the attention of the Department of Fisheries and are now producing large quantities of fish. The rivers proper have not yet been developed from the fisheries angle. The Department is in touch with other departments regarding new river basin development projects and action is being taken accordingly.

(iii) **India**

Detailed investigations directed towards the development of fisheries in reservoirs are in progress at the Lacustrine Unit of the Central Inland Fisheries Research Station (C.I.F.R.S.). Investigations of the possible effects of hydro-electric, irrigation and other multipurpose dams on fisheries will be taken up in the near future, with a view to providing suitable fish protection and passage facilities wherever necessary.

The Government has examined the question relating to the removal of trees, stumps and

obstructions for better exploitation of fisheries, and recommended that a representative of the State Fisheries Department should be included in the Development Board constituted for the administration of the River Valley Projects. Where such a Board does not exist, the development and administration of fisheries should be entrusted to the State Fisheries Department, and the fisheries development in all aspects should form an essential charge on the budget of the Projects concerned. It was also recommended that for ensuring maximum results adequate provision should also be made for removal of obstructions. This recommendation has been adopted by the States of Orissa, Bombay, Kerala, Bihar, Madras, Punjab and the Control Boards of Tungabhadra, Hirakud, Koyna and Nagarjuna-sagar.

The biological surveys are being undertaken by the Lacustrine Unit of the C.I.F.R.S. and by the State Fisheries Departments of Orissa, Madras, Mysore and Madhya Pradesh.

Recently India obtained the services of an FAO expert in deep water fishing. He has been training the Officers of the State and Central Departments in the use of improved types of fishing gear and in the assessment of populations in the large reservoirs connected with River Valley Projects.

(iv) **U.S.A. (Hawaii)**

The responsibilities for ensuring that fish and wildlife values are conserved in river basin developments are assigned to the U.S. Fish and Wildlife Service by a Congressional act. Other Federal Government agencies, such as the U.S. Corps of Army Engineers and the Soil Conservation Service, must clear projects with representatives of the U.S. Fish and Wildlife Service prior to their execution. The volume of work conducted has been slight; although it is anticipated that there may be some increase in the future. River basin developments in Hawaii have been primarily concerned with flood control projects and have not been of a nature to affect fish and wildlife values adversely.

(v) **Vietnam**

No further fisheries investigations have been undertaken on the Lower Mekong River Basin development scheme following the report of the FAO Survey which was undertaken in 1958.

b. Water pollution control

(*Recommendation No. A-14*)

(i) **FAO**

The report of the IUCN Meeting in Athens which was concerned in part with water pollution, and to which FAO Fisheries Biology Branch made a substantial contribution, has now been published with FAO assistance, and distributed as a Contributed Publication at the 9th Session.

FAO has continued its active collaboration with ECE and WHO in the field of water pollution control.

At the 29th meeting of the IPFC Executive Committee, a request was made for a bibliography and review of radioactivity of marine fish caught in the Pacific. This has been prepared by T. Laevastu and issued in the "FAO Fisheries Biology Synopsis" series as FB/60/S3. It was available as a contributed paper to the 9th IPFC Session.

FAO Fisheries Biology Branch has participated in the preparation of the technical report on "Radioactive Waste Disposal into the Sea" by an *ad hoc* panel of the International Atomic Energy Agency, which is now published by IAEA. Copies were distributed to members of Panel B under cover of a letter from the Secretary, 26/7/1960. Other panels, in which the Division (Mr. Wm. A. Dill, Mr. T. Laevastu) is participating, have now been set up to deal with radioactive pollution of fresh water and the legal aspects of radioactive waste disposal into the sea.

As a further contribution to dissemination of knowledge about the subject in the region, copies of "Radioactive Materials in Food and Agriculture", FAO Atomic Energy Series No. 2, have been made available in English and French editions as a Contributed Paper to the 9th IPFC Session.

(ii) **Ceylon**

Water pollution does not affect Ceylonese fisheries to any great extent as yet. Since it is not a pressing problem, no work on this subject has been undertaken.

However, it was reported to the 29th meeting of the IPFC Executive Committee that in Ceylon highly toxic insecticides were being used as fish poisons. It appears that fishermen are using proprietary preparations containing malathion, by mixing the concentrated solution with sand and scattering this over the area where fish are to be found.

The Government is seriously concerned on account of possible toxic reactions in fish consumers, and a survey of the situation is being carried out.

(iii) **India**

The All-India Institute of Hygiene and Public Health has been carrying out extensive surveys of river pollution in various parts of the country. The Central Inland Fisheries Research Station has been carrying out investigations at selected places along the Ganga River on the effects of factory effluents on the riverine fisheries. The apparent toxicity limits of six compounds found in the effluents of tanneries and textile mills on two different species of fish have been determined.

The pollutional effects of these wastes on a stretch of the River Ganga at Kanpur and of sugar and distillery wastes on the River Doha were investigated. Bioassay experiments to determine the toxicity ranges for some important species of fish were also made. A survey of the Damodar River indicated the existence of adverse effects on fisheries, caused by the effluents from a large number of industrial projects, particularly near the Panchet reservoir. Hence it is proposed to take up investigations in this region, with a view to assessing the extent of the deleterious effects of these effluents and to suggest remedial measures to eliminate the adverse effects of pollution. The Departments of Fisheries in Orissa, Madhya Pradesh, Andhra Pradesh, Mysore and Madras also carried out work on this subject.

(iv) Japan

During the period of 1959-60 a number of serious accidents occurred with respect to industrial pollution. A few examples which attracted considerable attention are mentioned below.

At the end of 1958, a strange "disease" arose in a community in Manamata, Kumamoto Prefecture, the city facing Ariake Bay on the western coast of Kyushu. With symptoms related to nervous paralysis the cases were limited to those persons who ate fish caught in the inshore waters off the city. In the absence of exact diagnosis as to its cause(s) it became named "Minamata" disease after the city. Meanwhile, the death toll of the epidemic reached 33. According to a report of a medical group at Kumamoto University, a possible cause of the disease was believed to be attributable to mercury found in waste water from a chemical fertilizer factory. However, another group of scientists, also concerned with the case, had reasons to differ. While scientific arguments and studies were under way, the local fishermen claimed themselves victims of industrial pollution, since some of them suffered from or died of the epidemic, and all were forced to stop fishing in the troubled water.

Detailed investigations of the case were assigned to regional fisheries laboratories and local universities. The fertilizer company has made a series of positive efforts to improve its waste water treating facilities. After long negotiation, financial compensation was paid for the claims of the fishermen against the company. The water in question is still closed to fishing under local administration.

In the neighbourhood of Urayasu on the innermost part of Tokyo Bay, mass mortalities of fish have occurred several times since June 1958. Fishermen asserted that the cause could be traced to waste from a paper mill. Disputes between both parties continued until the paper company improved treatment of its waste and indemnified the fishermen for their loss.

Two controversies occurred with respect to allegations by fishermen that the discharge of water from two power dams (one completed and

the other under construction), built on streams entering bays with fishing grounds, might disturb fish migration. The case of the completed dam was settled on the basis of cooperative investigation.

In view of these cases and many others, the Japanese Government established laws relevant to security of water quality in public areas and control of industrial pollution in 1958. In order to standardize procedures for investigating water pollution and its biological effects, a manual for water pollution investigation is now under preparation on the basis of contributions from regional laboratories and universities.

Radioactive waste disposal in the sea. With development of the atomic energy industry, problems relevant to waste disposal in the sea are anticipated. With this in mind, a close vigilance upon the situation has been maintained.

Since 1957, regional laboratories have been conducting, at the request of the Government, radiological surveys of sea water, marine organisms and sediments in areas adjacent to Japan. Work carried out so far is related to radioactive levels of marine organisms and their fluctuations from year to year, radioactive concentrations characteristic to various organisms, and the process of radioactive transition through food chains. According to these results, plankton in which radioactivity was found concentrated at a higher level than in other substances, is supposed to be a most suitable indicator of the activity in the sea. It has been suggested that general tendencies of radiological contamination of the sea can be made clear through surveys on gross *beta* activity of plankton which may be carried out with relative ease (see Nakai, Z., *et al*, 1960, Radioactivity of marine organisms and sediments in the Tokyo Bay and its southern neighbourhood).

It is thought that detailed investigations must be continued in regard to whether radioactive waste disposal in the sea will bring ill effect upon fisheries and ultimately upon people in general. At the same time, there may be an urgent need of finding out the present levels of radioactive pollution in various parts of the ocean

all over the world as the level of contamination in the sea is becoming higher and higher.

The report submitted as Japan's contribution to Panel B, Technical Committee I, for the 1959-60 inter-sessional period expressed the hope that the delegates at the present (9th) session would explore a possibility where the Member Governments will immediately commence surveys of the gross *beta* activity of plankton because these organisms are a best indicator of radioactive contamination of the sea and the procedure needed for surveys of this kind is relatively simple according to their experience. In the proposed surveys on an international level, attention should be given to standardization of the procedure and material on which basic radioactive levels are to be compared.

(v) Malaya

Until recently pollution of river waters by industrial wastes was not a problem of any importance. However, reports of pollution of river waters by industrial wastes from rubber factories has now caused some concern to those who are dependent on the riverine fisheries. It is reported that the fisheries have declined since the factories started operation. The problem was investigated with special reference to the character and extent of pollution, and on the effect on the fauna, insofar as the riverine fisheries were concerned.

This is one of the first cases in Malaya of pollution by industrial wastes affecting riverine fisheries and it is bound to become a major problem in the future, especially when fresh-water fisheries development is being encouraged in the rural areas.

(vi) Philippines

Many cases of water pollution are cropping up due to the establishment of factories along the rivers, sewage disposal, oil discharges from vessels, mining deposits, etc.

A national Inter-agencies Committee on Water Pollution Studies has been composed of representatives from the Bureau of Fisheries, Bureau of Health, Bureau of Mines, Bureau of Public Works, National Waterworks and Sewe-

rage Authority, Institute of Hygiene and International Cooperative Administration. The Committee is working on individual pollution problems throughout the Philippines. Teams are sent to investigate individual cases of pollution of public waters as these are reported. Most cases of pollution arise from the discharge of effluents by sugar companies which have set up paper mills to make use of their bagasse and other wastes. The waste waters from such mills which have high B.O.D. are released to rivers and estuarine bays and make fishponds virtually useless. In one particular case, in the Central Azucarera de Baie, the recurring problem has led the sugar company to acquire by purchase or reclaim free, fishponds through which paper wastes pass to the sea.

Another case of pollution is brought about by tailing waters from mines in several mining regions of the country. The use of certain chemicals toxic to aquatic life has been alleged to have led to the destruction of aquatic life in the lower part of rivers. This is especially true of gold mines using cyanide compounds to recover gold dust. Probably tailings from copper mines have the same deleterious effect on fish life.

In some areas, the refuse from saw mills and textile factories led to the destruction of fish in nearby fishponds and streams.

In the suburbs of Manila, the rapid industrialization led to the establishment of chemical factories and breweries bordering the rivers wherein all kinds of refuse are dumped into the river. This has led to several complaints filed by fish pond owners so that the Bureau of Fisheries is presently conducting investigations of these areas. Inasmuch as about seven factories are to blame, the process of setting up the damage contributed by each has to be determined and this required an individual evaluation of the effects of effluents from each factory. The Bureau of Fisheries is not yet ready to cope with problems such as this. However, it has been co-operating with other agencies and preparing reports to convince the government that a Pollution Board is badly needed to safeguard the conditions obtaining in the streams and bays. The absence

of any regulation to this effect on the establishment of factories has led to problems of this nature which are bound to increase especially with the rapid industrialization of the country.

(vii) **U.S.A. (Hawaii)**

There are both Federal and State laws concerning water pollution; however, aside from some pollution caused primarily by agricultural activities, such as the use of aqua ammonia for fertilizing sugar cane and which occasionally enters natural bodies of water carrying fish, this problem is not yet serious. It is anticipated that it will be one of increasing importance in the future.

5. FISH CULTURE AND FISH DISEASE CONTROL

a. Fish culture—general

(Recommendations Nos. A-7, B-7)

(i) **FAO**

The review by E.D. Le Cren on the application of science to inland fisheries has been widely distributed as an FAO Fisheries Study.

The lectures of the Bogor Training Centre have been distributed as FAO/ETAP report, in two volumes. (These were available at the 9th IPFC Session as a Contributed Publication). The Handbook on Fish Culture in the Indo-Pacific Region based on the work of the late Dr. Hora and T.V.R. Pillay is in the final stages of editing.

(ii) **India**

Intensive efforts are being made to improve methods of culture of indigenous carps (*Catla catla*, *Labeo rohita* and *Cirrhina mrigala*). After having standardised suitable methods for increasing survival of early fry in nurseries and raising them to the fingerling stage, efforts are now being directed to evolve suitable methods of culturing fingerlings in enclosed waters. The role of fertilizers (both organic and inorganic) and artificial foods in increasing the productivity of ponds and yield of fish is being investigated. Successful attempts have been made to induce the indigenous carp to spawn in confined waters by the injection of pituitary extract. It may be

noted that these carps normally do not breed in enclosed waters. This is a very important step in culture fisheries, since this obviates the necessity of collecting spawn from rivers, which involves considerable expenditure and difficulty in transport of spawn to various centres where the fish are cultured. With the success of induced breeding of carps, attempts are also being made to evolve suitable hybrids by inter-breeding different species. Preliminary observations on the growth of such hybrids show considerable promise. Studies are being continued, with a view to raising new strains of carps with better culturable qualities by selective breeding.

(iii) **Indonesia**

IPFC Occasional Papers 59/6 and 59/7 have been issued on fish production in West Java, and the function and significance of fish culture in relation to the regional/village economy, respectively.

(iv) **Malaya**

Advances have been made in the eradication of predatory fishes from old mining pools and re-stocking them with *Tilapia mossambica* and *Puntius javanicus*.

The arrival of Dr. S.W. Ling, FAO Inland Fisheries Expert, helped to initiate two important lines of research namely: spawning of pond-fish with pituitary extracts and also the culture of the freshwater prawn *Macrobrachium carcinus*. The spawning of *Puntius javanicus* by hormone injection has been successfully carried out by Dr. Ling. Difficulty was met in rearing the fry obtained by hormone injection and this is being studied.

(v) **Pakistan**

A number of nurseries and demonstration fish farms have been set up and a reclamation programme started to cover 30,000 acres of derelict waters in five years.

(vi) **Vietnam**

The following is an abstract of a report on the "Present Status of Fish Culture Development in Vietnam" which appears in its original French version as Annex F.

With respect to inland fisheries and fish culture, the major Governmental policies are to:

protect the aquatic fauna of inland waters from harmful exploitation;

improve the ecological conditions for a better production of aquatic resources; and

promote the extension of fishculture (brackish and fresh water) in newly resettled areas.

The above objectives are in the way of realization with encouraging results such as the following.

A law prohibiting abusive methods of catching was adopted by the National Assembly.

Many pilot fish culture farms are being set up and the area devoted to *Chanos* culture is increasing.

Fishcultural personnel are being trained adequately.

(vii) U.S.A. (Hawaii)

There has been considerable quantity of work on the cultivation of *Tilapia* with a view to utilising the young as bait for tuna fishing.

A summary of the use of pituitary hormones in fish culture has been issued as IPFC Occasional Paper 59/11.

b. Nutrition of fish under cultivation

(Recommendation No. A-11)

(i) India

Work is in progress at the Central Inland Fisheries Research Station. Work done by the Orissa Department of Fisheries indicates that a combination of hydrolysed proteins and carbohydrates in the ratio of 50:30 gives the best result in so far as the growth of fish is concerned.

(ii) Pakistan

Rice-bran, oil-cake, and compost are being used for fattening fish.

(iii) U.S.A. (Hawaii)

Considerable work has been done on feeding of *Tilapia mossambica* in relation to the number of young produced under various dietary regimes.

(see section on "Non-indigenous fishes")

(iv) Vietnam

Experiments on the feeding habits and food of the common carp were conducted at Thuduc Station, but no definitive results were obtained.

c. Soil composition in fish ponds

(Recommendation No. A-8)

(i) FAO

The paper by Mr. A. Wurtz of France on this subject, reported at the 8th Session to be completed, has been edited and translated into English. It will be issued as an FAO Fisheries Biology Technical Paper in 1961.

(ii) India

Experiments reported briefly at the previous session were repeated and the results obtained confirmed. A general survey of soil condition and water quality of piscicultural tanks in different districts of Orissa and West Bengal showed that with few exceptions the soil was normally alkaline in reaction, available nitrogen was quite fair, and that available soil phosphorus varied from a low to a fairly high concentration.

Regular and periodic observations on soil condition and water quality of a number of selected tanks in Orissa and Madhya Pradesh showed that in slightly alkaline or in slightly acidic soils available soil phosphorus played an important role in determining the productivity of fish ponds. A direct correlation was shown between available phosphorus and the annual yield of fish per hectare. Available soil nitrogen, which was generally found to be quite fair in all the tanks, fluctuated rather irregularly, bearing no correlation either with available phosphorus or with fish production.

Field experiments on the trace element effects conducted with the minor element Manganese showed that organic productivity of ponds as assessed by gravimetric estimation of net plankton was higher in ponds treated with superphosphate and manganese sulphate than in untreated control ponds and ponds treated with superphosphate only.

d. Aquatic weed control

(Recommendation No. A-10)

(i) Ceylon

The control of aquatic weeds such as *Salvinia* and *Eichhornia* is being done by the Department of Agrarian Service. At conferences concerning the control of these weeds a representative of the Fisheries Department is invited to be present. To date weeds have not been a serious problem as far as the fisheries programme is concerned.

(ii) India

The Central Inland Fisheries Research Station conducted surveys of the ponds with a view to find out the relation between the presence and nature of weeds and the physico-chemical features of the water and soil. It was observed that generally shallow ponds were infested with weeds and most of the perennial tanks over 15 feet deep were free of submerged vegetation. Ponds with steep banks were found generally to be free of marginal vegetation. Turbidity of water and algal blooms appeared to be inhibitory factors for the growth of weeds. The weeds were found to grow best on humus and combinations of humus with other types of soil. There was also a distinct correlation between the humus content of the substratum and total alkalinity of water. It appears that a fairly high amount of organic debris and high total alkalinity of soil and water encourage profuse growth of some weeds like *Hydrilla*. Experiments on the control of weeds by the application of organic fertilizers, sodium arsenite, borax, fernoxone, 2-4-D and extracts of various wild plants containing growth inhibiting substances are being carried out.

The use of urea and free ammonia have given successful results in the control of several submerged and some emergent and floating weeds. This method has been extensively used and found to be effective and economical. Urea and ammonia act not only as weedicides but also as fish poisons in eliminating predators from fish ponds and as fertilizers. Sodium arsenite at 5 p.p.m. also gave satisfactory results. Experiments on the mechanical removal of weeds were conducted by the Orissa Department of Fisheries.

Preliminary observations on the use of the Chinese grass carp for controlling weeds in fish ponds has indicated that about 150 fish (300 to 500 gms in wt.) could completely clear a one-hectare pond in one month.

(iii) Pakistan

Weed control research is being carried out. Some measure of success has been achieved and the results are being published.

(iv) U.S.A. (Hawaii)

Tilapia zilli has been successfully employed for this purpose in impoundments designed to hold water for sugar cane irrigation, especially on the island of Maui. This species succeeded in clearing a number of sizeable reservoirs of all aquatic vegetation in less than a year.

e. Non-indigenous fishes

(Recommendation No. A-9)

(i) Ceylon

Laboratory studies on growth rates of *Tilapia* in waters of various salinities ranging from completely fresh water to 100 per cent sea water is under way. Experimental gill netting has revealed that *Tilapia* does not thrive well and fail to breed in waters above an elevation of 1,000 feet. The introduction of *Tilapia* in waters above 1,000 feet is now being discouraged. (*Tilapia* was originally introduced into Ceylon from Singapore in 1951.)

Cyprinus carpio is being bred in large quantities at the Research Stations in Colombo and Polonnaruwa and introduced into the inland waters. Fair numbers of them are being captured

in the larger water bodies like Norton Bridge and Castlereigh reservoirs. *Cyprinus carpio* weighing as much as 15 lbs were taken in a large irrigation reservoir at Polonnaruwa, and fish weighing over 10 lbs are not uncommon. The *Cyprinus carpio* that are being stocked in Ceylon are the offspring of parents which were imported from Bangkok and Singapore.

The Giant gourami, *Osphronemus gourami*, is being cultured in Colombo and Polonnaruwa. From these two stations fry are stocked in various parts of the island. (This fish was first introduced into Ceylon from Java about 1909.)

Preliminary investigations reveal that the introduction of foreign species into Ceylon has had very little or no ill effect on indigenous species. On the other hand it has increased the production of fish from the inland waters. The popular indigenous varieties like *Ophicephalus striatus* continue to form a sizeable proportion of the harvest from these waters.

(ii) India

Intensive work on the culture and production of *Tilapia* and the effect of its introduction on indigenous fishes was carried out. Experiments have shown that *Tilapia* is not desirable for extensive culture in India. *Tilapia* appears however to be of value as forage fish as indicated by experiments on the culture of Murrels in combination with *Tilapia*.

Investigations on experimental culture of pure strain of common carp (scale carp), obtained from Bangkok, were carried out. The growth of this carp in experimental ponds was found to be better than *Cirrhina mrigala*, as good as *Labeo rohita*, and slower than *Catla catla*, which are the indigenous carps usually cultured in the country. In view of the quick growth and breeding in impounded waters *Tilapia* has become very popular and is being extensively distributed and cultured in different parts of the country.

Small consignments of Chinese Silver carp and Grass carp have been obtained and are being studied at Cuttack. The Silver carp have attained a maximum weight of 3.4 kgs. in 13 months and the Grass carp 1.1 kgs. in 10 months.

Further work is in progress on these two fishes. State Fisheries Departments of Orissa, Madras and Bombay have also carried out extensive work on exotic species of fish.

(ii) Korea

For experimental purposes, a cargo of 270 adult and 200 young *Tilapia mossambica* was introduced from Thailand in May 1955 and transplanted into the Government-operated Chinhae hatchery.

The small demand for this species by fish culturists and the expenses for the fuel necessary to over-winter the brood stocks at the hatchery are among the principal reason for closing out this tentative culture project.

At present, only about 2,000 brood stock are maintained at the Onyang Hot Spring Ponds to maintain the stock for any future demands in Korea.

(iii) Malaya

Puntius javanicus continued to be popular and steps are being taken to meet increasing demands for fry. Indian carp, *Catla catla*, introduced by the Fisheries Department, has gained popularity among fish-farmers and in 1959 6,000 fry ordered as a trial consignment from India were taken up immediately. The fish showed better growth rate than *Aristichthys nobilis* when reared in the same mining pool, attaining a weight of 10-15 lbs. in one year.

(iv) Netherlands New Guinea

Preliminary findings on the culture of *Tilapia mossambica* have been published as IPFC Occasional Paper 60/1.

(v) Pakistan

Tilapia mossambica, *Trichogaster pectoralis*, *Ctenopharyngodon idellus* and *Puntius javanicus* have been imported during the last few years. Of these the culture of *Tilapia* has been expanded and thousands of fry have been distributed for cultural purposes.

(vi) U.S.A. (Hawaii)

Live bait for tuna fishing in the Hawaiian skipjack fishery has always been a critical problem due to the almost constant shortage of the naturally existing bait supply. One of the first species to be considered as a possible supplementary bait was the young *Tilapia mossambica*. Preliminary field trials indicated that *Tilapia* was an adequate baitfish and because of these encouraging results, the Honolulu Biological Laboratory initiated a feasibility study on the production of bait-size *Tilapia* by the tank-culture method.

Experiments designed to assess factors associated with reproductive rates revealed that only a slight increase in water temperature was necessary to increase the spawning frequency during the winter months. Furthermore, prolonged high temperatures seemed to have a detrimental effect on spawning fish. It was found that three females per male resulted in the highest reproductive rate, while a concentration that allowed 4.0 square feet of bottom area per male and 1.0 square foot per individual provided the most optimum conditions for courtship and spawning. Brood stock fed a high-quality, pelletized trout feed had a higher reproductive rate than those maintained on low-quality food like millrun and pelletized rabbit feed. In terms of costs of producing a given number of young, the trout feed was the least expensive. The reproductive rate was significantly higher among brood stock maintained in brackish water of about 10 ‰ than those kept in fresh water.

Young *Tilapia* held in less crowded tanks had faster growth rates than those in more crowded tanks. There was also a faster growth rate among the young reared on a high-quality feed than those reared on low-quality feed. Young fish raised in brackish water of 10 ‰ underwent a remarkably fast growth.

The material presented here is only a summary of the results of some of the experiments on reproductive rates and growth rates. Detailed aspects of the experiments and discussion of other subjects, such as mortalities, cannibalism and disease will be published in a Fishery Bulletin now in press.

Three additional species of *Tilapia* have been introduced; these are *T. macrochir*, *melanopleura* and *zilli*. In addition, the threadfin shad, *Dorosoma petenensis*, has been introduced under cultivation as a potential bait-fish, and another species, the Marquesan sardine, *Harengula vittata*, has been introduced as a bait-fish and released generally in the sea.

A paper concerned with non-indigenous fishes in Hawaii is in press. Brock, V.E., The introduction of aquatic animals into Hawaiian waters. *Intl. Revue ges. Hydrobiol.*, 1960.

f. Fish culture in rice fields

(Recommendation No. C-9)

(i) Ceylon

This work which was suspended in 1958 has not been resumed.

(ii) India

The Department of Fisheries in Bihar State conducted detailed experiments in the culture of fish in deep water rice fields. The experiments have yielded good results. Experiments conducted at the Central Inland Fisheries Research Station have indicated that there is not much scope for this work in many parts of India where the water level in rice fields is low.

Experiments conducted in Uttar Pradesh showed that: (1) both fish and paddy could simultaneously grow with mutual advantage; (2) paddy harvest registered an increase though it was considered nominal.

Experiments designed and conducted in Andhra Pradesh showed that: (1) fish came up well in plots where the crops was well grown because of protection offered by the crop against predators and heat; (2) stemborers were entirely absent in plots with fish as compared to plots without fish; (3) the harvest of paddy and fish are in no way representative.

Bombay State experiments showed that pisciculture in paddy fields in this State is not an economic proposition because: (1) most of the fields get inundated; (2) the soil in paddy fields is too porous to maintain a water depth to

12 inches throughout; (3) of the absence of suitable (rapidly growing) carp fry at a low cost in the State.

The culture of prawns on a commercial scale in rice fields is a common practice in Kerala. The total area under culture has risen from about 4.5 lakh acres in 1949-50 to about 10 lakh acres in 1953-54. The water levels in such fields ranged from 0.3 ft. to 4.0 ft. and the average

yield of prawns from A to C Classes of fields ranged from about 360 pounds to about 1,000 pounds.

(iii) Indonesia

Due to unfavourable circumstances, the area of rice fields used for fish culture has decreased during the last few years, which has resulted in a decrease in their total production of fish.

Year	Area (ha.)	Yield of Fish (tons)
1957	120,158	30,370
1958	90,180	12,258
1959	93,629	12,204

In regard to ascertaining the possibilities for production per unit of area, experiments with carp cum rice carried out in West Java gave the following results:

Stocking rate per ha.	Length of stocking material	Total weight of stocked fish	Rearing period	Yield of fish
	cm.	kg.	days	kg. per ha.
2,250	8-11	12.5	24	27.5
1,400	9-11	10	22	26.0
10,500	3-5	7.5	20	47.5

The effect of fish cultivation on the following rice crops in the area of Tjinudjur may be illustrated as follows:

Preceding crops	Yield of rice tons/ha.
Tomato	5.22
Beans	4.8
Fish	5.9

The effect of fertilization on the rice crop and fish yield is being studied.

(iv) Malaya

Puntius javanicus introduced into a padi-cum-culture pilot plot, fed on the young padi-

plants and caused serious damage to the rice plants.

(v) Vietnam

The experiments begun in 1959 have had to be interrupted.

U.S.A. (HAWAII)—LIST OF PUBLICATIONS ON TUNA
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1959

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Construction and catch selectivity of albacore gill nets used by POFI in the central North Pacific. U.S. Fish and Wildlife Service, Comm. Fish. Rev., 21(8): 1-6 August 1959, Spp. No. 556.

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A new method of handling longline gear—a description of POFI "tub" gear. Modern Fishing Gear of the World: 430-432.

Matsumoto, W.H.

Descriptions of *Euthynnus* and *Auxis* larvae from the Pacific and Atlantic Oceans and adjacent seas. Carlsberg Foundation's Oceanographical Expedition round the world 1928-30 and previous "Dana"—Expeditions. Dana Report No. 50, 1959.

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Effect of water clarity on albacore catches, Limnology and Oceanography 4(1): 86-93, January 1959.

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and R.N. Uchida

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Some aspects of the biology of the central Pacific great blue shark, Proceedings of the Hawaiian Academy of Science, 32nd Annual Meeting. Abstract p. 28.

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Yamashita, D.T. and K.D. Waldron

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Research vessel is fitted for underwater observation of fish. *Pacific Fisherman*, 58 (8): 8-10.

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Notes on the Hawaiian frigate mackerel of the genus *Auxis*. *Pacific Science*, 14 (2): 173-177.

Murphy, G.I.

Introduction of the Marquesan sardine, *Harengula vittata* (Cuvier and Valenciennes), to Hawaiian waters. *Pacific Science*, 14 (2): 185-187.

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Japanese summer fishery for albacore (*Germo alaluuga*). U.S. Fish and Wildlife Service, Research Report No. 52, 29 p., 1960.

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COMMENTS ON
REPORT OF THE INTERNATIONAL TRAINING CENTRE ON THE METHODOLOGY
AND TECHNIQUES OF RESEARCH ON MACKEREL (RASTRELLIGER)

October/November 1958 — Bangkok, Thailand.

I. John Blaxter, Scottish Home Department, Aberdeen: letter of 30 November 1959.

1. Food and feeding

- (a) A programme of aquarium studies of rates of digestion is needed to determine how long food remains in the gut in order that feeding may be correlated with time of day.
- (b) Although Battle *et al.*, 1936, gave rates of clearance of herring stomachs as a function of temperature, it is now known (see Marine Research, Scotland", 1958, No. 6) that rates of clearance depend also very much on the amount of food taken before and after a test feed.
- (c) Recently published relevant papers on feeding of mackerels giving maintenance diets, measurements of food for growth, and so on, are:

Hatanako, M., 1957. Growth and food consumption in young mackerel, *Pneumetophorus japonicus* (Houttuyn). *Tohoku Journal of Agricultural Research*. 7 (4): 351-368.

Hatanaka, M. and M. Takahashi, 1957. Utilization of food by mackerel, *Pneumetophorus japonicus* (Houttuyn). *Tohoku Journal of Agricultural Research*. 7 (1): 51-57.

2. Marking

It would seem desirable first to conduct comparative aquarium experiments with the different types of tag which might be used.

3. Identification of stocks

It is suggested that the racial significance of fecundity might be examined as this is a valuable characteristic in herring.

4. General

It is suggested that some priority be given to experiments to find the best ways of maintaining large mackerel in aquaria.

II. B.B. Parrish, Scottish Home Department, Aberdeen: letter of 18 December 1959.

1. Length measurements

- (a) There is an error on page 9. The studies of relation between total and fork length in plaice were conducted by John Gulland; Parrish dealt with the same relation in herring.
- (b) Although the description of length measurement problems in the Report is good, there is still a case in favour of choosing class intervals so that their mid-points rather than their lower limits are integers. It is true that even numbers of scale intervals cannot then be grouped and retain mid-points as integers. However, apart from this, measurement in effect to the nearest unit rather than to the one below is easily effected by using a normal scale in which the zero coincides with the headboard, integral numbers are written bold in the spaces between bold scale marks, the latter being at distances from the headboard of half a unit, $1\frac{1}{2}$ units, $2\frac{1}{2}$ units, and so on.

Different scales should be used for accurate measurement to the nearest mm. and rapid measurement using larger units because an excessive number of scale marks both increases the frequency of error and reduces the speed of measurement.

2. Measurement of areas

Recently the International Council for the Exploration of the Sea has considered tests carried out by von Brandt and Bohl with the "Polish", "Scottish" and "Lowestoft" mesh gauges. It seems now to be clear that the "Westhoff" and "Lowestoft" modifications of the Scottish gauge are the best instruments and the Scottish gauge in its original form or in one of its modifications is now widely used. It is strongly urged that this might be adopted as a standard gauge in the Indo-Pacific area.

3. Racial studies

Although this section is very good, the implication that racial investigations should take a rather lower priority than hitherto may not be generally accepted. It can be argued that knowledge of North Sea herring biology and dynamics has increased greatly as a result of the intensive so-called racial investigations which have been carried out. A clear understanding of the objectives of such studies is, however, essential and this has now always been evident in the past. More information about the movements of herring

has come from studies of meristic and physiological characters than from tagging. Further, the results of these studies have supplied initial clues on which successful tagging experiments have been based. Continuation of intensive character investigations with all countries using the same methods is therefore advocated in this case. Lack of comparability between techniques used in different countries has been a serious deficiency; for example, one worker has studied vertebrae in one area, another studied growth characteristics in another area, and so on.

It is a little dangerous to give the impression that age compositions may provide one of the best criteria of population homogeneity. It is possible to have a consistent age composition picture and still have a large element of emigration from a particular fished area.

III. A.C. Simpson (Burnham U.K.)

Commented on the estimation of fecundity. Description of recommended methods was published as IPFC Occasional Paper 59/12.

RASTRELLIGER TAGGING EXPERIMENT*

by

Sant Bundukhul and Suan Ruamraksa

INTRODUCTION

Marking of live fish and releasing them into the water has long been a practice in foreign countries, for studying the life history of the fish in relation to migration, growth rate, age-grouping of sub-populations, estimation of quantity of fish in any given area and proof of the trace on fish scales, which is believed to be the mark for age determination in some varieties of fish.

Normally the method of marking has been to use tags, made of different materials and in various shapes. Sometimes the body of the fish is marked by clipping the fins, dying with colours or injecting internally. At present experiments by inserting a radio-active tag within the body of fish are being made.

The most popular method is to mark fish with tags of plastic, nylon, or some kinds of metal in different shapes, attaching them externally or inserting internally in the body-cavity of certain live fish and releasing them into the water, recording the length of fish, weight, date and place of release and sometimes collecting scale samples for future reference. When that particular fish is recaptured by a fisherman and handed to the officer concerned, he should be given a reward. There should be records of time, date, place and equipment used, means of catching the tagged fish, and weight and size for research purposes. External tags are often attached to the operculum, or beneath the dorsal or tail fin or internal tags may be inserted in the body cavity of fish, e.g. sardine, which is later found by a special instrument consisting of an iron magnet attached to the trough for fish viscera in a canned fish factory.

Objective of Rastrelliger Tagging

Thailand started a plan for tagging Pla-tu in 1959 and an external tagging experiment took place in June 1959. The work was divided into

two phases: First, dart-tagging the Pla-tu and releasing them in a specially built wooden tank, in order to study the effect of tagging on the fish, especially the rate of mortality of tagged fish, and their activity; secondly, to release the tagged fish into the sea and record all the necessary details. Any fishermen who catch the tagged fish and return them to the Department of Fisheries, are rewarded. The result of this work will be of value in studying the life history and in estimating the population of Pla-tu in the Gulf of Thailand. These are necessary in considering regulations to preserve and protect the fish stocks.

Experiments on dart tagging in accordance with the first plan: The following are problems to be studied primarily:

- 1) Method of transportation of live Pla-tu from stake trap and trap-net to wooden tank, reduction of the rate of mortality; the equipment used.
- 2) Method of dart tagging and equipment used.
- 3) Time taken in dart tagging.
- 4) Mortality rate of tagged fish.
- 5) Number of lost tags and reason for loss.
- 6) Time taken to heal the wound.
- 7) Gathering of tagged and untagged fish.
- 8) Clumsiness or reduced activity of fish because of being tagged.
- 9) Visible living organisms, e.g. algae etc.
- 10) Growth of tagged fish in the wooden tank.

*Translated from: Thai Fisheries Gazette, 13 (1): 5-9, Jan. 1960.

Procedure

Transfer live Pla-tu and punch a 4 cm. hole in the bottom of the boat in order to let the water flow in regularly, then tow the boat from the Poh trap to the holding tank.

The fish are left in the tank for approximately 15 days so that those which are badly bruised die and the remaining fish rest in normal condition and get used to the tank before the tagging experiment.

Half the number of the conditioned fish are tagged, using a scoop-net, and lifting them from the resting-tank to mark the fish in an oval tub and releasing them into the tub for tagged fish. The other half (untagged fish) remain in the resting tank in order to demonstrate that if after tagging some fish die, it could be considered whether or not the fish die because of tagging. For example, if the fish die in the tub for tagged fish, but in the resting tank there is none dead, this will demonstrate that the fish died because of tagging. But if the fish in both the tub for tagged fish and in the resting-tank die, it means that there will be other causes of death besides tagging, which would be investigated later. After keeping separate the tagged and the untagged fish in their appropriate tanks for a period of time until it is sure that no deaths occur, then release the tagged fish into the tank for the untagged fish. This procedure is meant to demonstrate whether they can get along well and whether there are any visible differences of strength, activity, speed of swimming and so on.

Besides this, we put phytoplankton as food for fish in the tank to observe their reaction and to note whether the tags will retard the activity of fish when feeding and to compare these with the untagged fish.

Equipment used

- 1) A boat for transporting live Pla-tu to the resting-tank, about 10 m. in length (a 4 cm. hole punched in the bottom to let the water in).
- 2) Wooden resting-tank and a tank for tagged fish of the same size, (159 × 150 × 250 cm.), a frame for hanging the tanks (180 × 300 cm.) using 4 empty lubrication oil tanks of 200 litres capacity as buoys.

These are connected to each other (similar to the shape of a compass) to prevent the tanks from being rolled to and fro by the waves.

- 3) **Tags:** A dart tag consists of 2 parts nylon shank, size Ø 1.8 mm., 14 mm. long, fluke 11.3 mm. long and plastic tube 7-10 cm. long, to be attached to the shank.

Other equipment consists of split-through silver cylinder, wooden base to hold silver tube, chromium needle, oval tub, scoop-net, etc.

Procedure

- 1) Take out 10-15 conditioned Mackerels.
- 2) Use the longhand scoop-net to take out the fish, one by one, and put them into the tank containing sea water. One man holds the fish with two hands, the right hand takes hold of the upper part and the left, the lower part, leaving open the space at the first dorsal fin for the other man to insert the tag conveniently.
- 3) The other man using chromium needle pierces the fish skin to make a hole and inserts the silver cylinder to which a tag is inserted, allowing

the fluke to turn towards the fish body, inclining a little towards the front. This piercing must be very deep so that fish skin on the other side is nearly pierced. The place pierced is at the lateral line of the back-bone of the fish, or underneath the first rear fin at the fifth or sixth hard fin. After tagging, the fish are released into the tank.

Results obtained

- 1) None of the fish died as a result of being tagged, and the tags were not lost.
- 2) Seven days after the tagging experiment, examination of fish showed that some wounds were healed.
- 3) Fifteen days after tagging, the wounds

of fish were examined; most of the fish were healthy.

- 4) Tag attached to the fish did not decrease the efficiency of fish. The tagged fish were still active and their speed of swimming was as high as the untagged fish.
- 5) Tagged fish get along very well with the untagged fish. On some occasions, the tagged fish was the leader of the school. Tags, even when full of algae, did not affect the fish.
- 6) Tagging *Rastrelliger* with the dart tag was generally successful. It is hoped to tag the fish and release them into the sea, to study migration and to estimate the population of *Rastrelliger* for the next year.

ANNEX D

REPORT ON USE OF 45-CM. MARUTOKU-B PLANKTON NET
BY NAGA EXPEDITION, JULY 27, 1960.

by

Dr. Edwards Brinton, et al.

Where Used: The 45-cm.-plankton net provided for Naga Expedition by FAO has been used on four survey cruises by the "Stranger".

Cruise S-2, South China Sea, Dec., 1959,
used at 16 of the 26 Stations.

Cruise S-3, Gulf of Thailand, Jan., 1960;
used routinely, all 32 Stations.

Cruise S-4, South China Sea, Feb.-March,
1960; used at 28 of 42 Stations.

Cruise S-6, South China Sea, May-June,
1960; used at 11 scattered stations out
of the 42 stations occupied.

How Used: The net has been used for vertical hauls, generally from a depth of 150 meters in deep water, or, in shallow water, from as deep as the depths of the bottom permitted. A Japanese T.S.K. flow meter was mounted in the mouth of the net, and the net was hauled up at a speed of 25 meters per minute.

A 1-meter net has been routinely used by Naga Expedition. The data from the two nets are comparable only in that they sampled at the same stations. The 1-meter net was towed obliquely to and from a depth of about 140 meters, or as deep as the depth of the bottom permitted. The vessel was underway at a speed of 1.5-2 knots. Thus the net sampled during both its descent and ascent, and sampled across a distance of 200-800 meters, depending upon the depth.

The 45-cm. net, hauled vertically while the ship was stopped, sampled much less water. However, from the flow-meter readings it was possible to standardise both samples on the basis of 1000-cubic-meters of motor-strained.

Quantitative Differences in Samples Collected by the Two Nets: A comparison of the volumes of plankton sampled by each net are given in the accompanying table and maps for cruise S-3, in the

Gulf of Thailand. The comparison shows that the standardised volumes for each net are not out of line with each other. The 45-cm. net sampled more plankton at 21 stations, the 1-meter net at 6 stations, and at two stations the volumes were about equal.

Contoured maps of the distribution of the plankton volumes indicates that there may be a greater tendency for the 45-cm. net to be the better collector around the margins of the Gulf-regions where small copepods and phytoplankton are generally most concentrated. The contour level here are the same as those used routinely by the California Cooperative Oceanic Fisheries Investigations, and indicate that the Gulf of Thailand is a rich body of water. It was richer still in April 1959, but poor in October, 1959.

Qualitative Differences in Samples Collected by the Two Nets: Few measurements or counts of the material in the 45-cm. net samples have been made, owing to a shortage of time and help. In general, it appears that this small net samples small copepods and larvae of euphausiids and decapods better than the 1-meter net. We are particularly glad to have the early larval stages of the euphausiids and the other micro-plankton will doubtless prove of value at a better time when they can be worked up.

The mesh size or aperture width of the 45-cm. net is about 0.33 mm., compared with 0.65 mm. for the 1-meter net. Thus, it is reasonable to expect that organisms in the smaller size range would be better sampled by the finer mesh. Undoubtedly, the smaller net is the better collector of fish eggs having a diameter less than 0.65 mm.

The 1-meter net samples the larger larval fishes, crustaceans, and salps somewhat better than the 45-cm. net. In addition, the large net provides about four-times as large a sample, per unit of towing time.

Neither net can, in any sense, be regarded as a phytoplankton net, though chains of diatoms or large individual cells appear to be more frequently caught by the 45-cm. net than by the coarser large net.

About the 45-cm. Nets: Nets of this apperture (mesh) size have a tendency to clog in rich waters, causing turbulence in the mouth of the net. This one does, and is not long enough (i.e., does not have enough filtering surface in relation to the size of the mouth of the net) to be entirely efficient. This net looks like one distributed by the Plymouth Laboratory in England that has this shortcoming.

A similar net—45-cm. mouth diameter, 0.33 mm. mesh width, but 160 cm. long, as compared with the 85 cm. length of this FAO net—was recommended for general use at a meeting held in Hawaii in April, 1956, in connection with the Norpac oceanographic expedition. It was accepted by those in attendance from Japan, France, Canada, and the U.S.A. I don't have the reference to the reports of that meeting, but it can be obtained from J. L. Reid, Scripps Institution of Oceanography, La Jolla, California. This net known as the "Norpac Standard" is used routinely by most Japanese agencies and by others, in conjunction with other standard nets such as the standard 1-meter CCOFI-POFI net used by Naga Expedition. We don't at present have a 45-cm. net on Naga, and are glad to have had the use of your similar net.

A comparison of the ability of the Norpac Standard net and the 1-meter net to catch small crustacean plankton has been made (Brinton, in press, scheduled for April, 1961, *J. Limnology and Oceanography*), based on collections made from tandem oblique tows made with the two nets on the same wire. In general the small net caught significantly more larvae, while the large net was somewhat better for adults and for the qualitative enumeration of the rarer species.

We are strong advocates of the oblique tow, as compared with the vertical haul, wherever the vessel and equipment are capable of making them. Of course, a flow meter is needed for the oblique tows in order to obtain an estimate of the volume of the water strained. In a vertical haul, if no flow meter is available, the volume of water strained can be estimated from the length of the vertical column,—if the net is straining reasonably well (as it usually was on Cruise S-3): compare values in columns 3 and 4 in the enclosed table). The effect of "patchiness of plankton" is less with the oblique tow than with the vertical tow; also, the roll of the ship has no chance to wash out the net, as it does during a vertical haul.

The volumes of plankton obtained by the 45-cm. net, hauled vertically are so small that they cannot always be accurately measured. A relatively high proportion of the smaller organisms in such a small sample may be lost during the operation in which the displacement volume is measured. Nevertheless, the value so obtained for the 45 cm.-net showed general agreement with those obtained for the 1-meter net.

COMPARISON OF ESTIMATED PLANKTON VOLUMES SAMPLED,
FAO 45 cm.-NET AND "STRANGER" 1 M.-NET

Cruise S-3 (January 1960) Stations.	45 cm.-Net Vertical haul			1 M.-Net, oblique haul		Standardised Volumes compared (cc. Plankton per)	
	Measured Displace- ment Vol. of Plank- ton Caught. (cc.)	m ³ of water Strained, based on reading of Flow meter.	m ³ of water Strained, based on vertical dis- tance of haul.	Measured Displace- ment Vol. of Plank- ton Caught. (cc.)	m ³ of water Strained, based on Flow meter reading.	45 cm.-Net	1 M.-Net
1	1.4	9.8	4.0	62	348	143	144
2	3.5	7.2	8.0	92	385	486	219
4	1.05	7.8	10.0	38	507	134	75
5	0.8	4.5	5.0	13	365	175	36
6	0.4	5.6	3.0	13	254	70	51
7	2.0	3.1	3.0	177	160	646	1107
8	6.0	4.9	4.0	76	221	1124	343
9	6.0	7.2	8.0	198	185	840	1070
10	1.05	10.0	10.0	64	427	105	150
11	1.8	8.0	10.0	81	351	230	230
12	2.4	5.8	10.0	77	459	408	168
13	1.3	5.8	9.0	43	306	227	140
14	1.6	2.2	4.0	50	338	713	148
15	1.6	—	3.0	67	346	523	193
16	1.6	5.6	6.0	65	316	282	203
17	3.15	6.8	10.0	122	550	463	225
18	2.6	—	13.0	47	562	202	84
19	1.05	9.5	10.0	121	512	110	236
20	3.9	6.2	4.0	93	222	634	418
21	1.3	3.4	4.0	48	240	387	200
22	1.3	8.1	6.0	71	297	161	239
23	2.4	7.5	10.0	75	503	314	148
24	2.4	10.05	10.0	67	579	235	117
25	2.6	—	10.0	81	546	262	151
26	2.4	5.6	9.0	42	383	420	109
28	0.6	5.9	6.0	44	254	88	173
29	5.8	4.1	4.0	68	249	1408	272
30	3.15	3.4	6.0	82	272	927	301
32	1.6	3.7	5.0	90	260	424	346

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ETAT ACTUEL DU DEVELOPPEMENT ET DES RECHERCHES DE LA PISCICULTURE AU VIET-NAM*

(période entre la VIII^e et la IX^e session de l'IPFC)

A.— Politique gouvernementale en matière de Pêches continentales et de Pisciculture.

En matière de pêches continentales et de la pisciculture, la politique gouvernementale suivie jusqu'à ce jour, reste inchangée. Elle consiste à :

- 1) Protéger la faune aquatique fluviale et lacustre contre les abus d'exploitation.
- 2) Créer des conditions favorables à la conservation et à la propagation des espèces ichthyologiques locales.
- 3) L'aménagement piscicole des eaux lacustres naturelles.
- 4) La mise en valeur des eaux continentales et estuariennes par le moyen de la pisciculture des espèces d'eau saumâtre.
- 5) L'extension de la pisciculture d'eau douce dans les zones agricoles récemment créées (centres de réfugiés, villages communautaires pilotes, agrovilles, etc...) aux fins de fournir à la population nouvellement installée, un apport d'aliments d'origine protéinique.
- 6) L'accroissement de la production d'alevins d'espèces piscicoles intéressantes par les stations d'alevinage gouvernementales.
- 7) Effectuer des recherches appliquées en matière de pisciculture.
- 8) La formation technique des cadres auxiliaires en vue de les utiliser dans la propagation et l'extension de la pisciculture.

B.— Réalisations:

Se basant sur les grandes lignes énumérées ci-dessus sur la politique gouvernementale en matière de pêches continentales et pisciculture, le service technique responsable a pu réaliser ce qui suit :

- 1) Faire adopter un projet de loi portant sur l'interdiction de la pêche des poissons en état d'alevins et de l'usage des matières explosives et nocives dans les cours d'eau, lacs, étangs et lagunes, etc...
- 2) Bien que des recherches en cours ne permettent pas encore de déterminer exactement les lieux de reproduction (spawning ground) de certaines espèces locales, un essai de réserve piscicole aménagée a été mis sur pied dans la région de la Plaine des Joncs réputée pour être l'un des endroits les plus poissonneux du pays parce qu'elle présente des conditions écologiques les plus favorables.
- 3) En vue d'un aménagement piscicole rationnel des eaux lacustres, des études au point de vue physiques, chimiques et biologiques des lacs naturels dans la région des Hauts Plateaux du Centre Viêt-Nam (province du Darlac, province de Tuyên-Dúc, etc...) ont commencé depuis 1959.
- 4) Les eaux saumâtres lagunaires et estuariennes le long des côtes du Viêt-Nam occupent une superficie relativement importante.

*Prepared by M. Le Van Dang, Inspector of Fisheries, Chief, Fishculture Service, Directorate of Fisheries, Saigon, Vietnam, 1960.

Mais une partie minime seulement a été utilisée depuis quelques décades à la production des poissons d'élevage. La méthode rudimentaire utilisée jusqu'ici qui consiste en un stockage non sélectif à la fois d'espèces ichthyophages et autres, n'a donné qu'un rendement dérisoire.

Après une année d'investigations (1958-1959) le long de la côte, des points de concentration saisonnière de larves de *Chanos* ont été découverts. Des essais de ramassage (fry collecting) furent conduits et les larves ainsi recueillies ont été dirigées vers les stations d'alevinage gouvernementales où elles sont élevées dans les "nursary pond" jusqu'au stade "fingerling". Dès lors le *Chanos* est distribué aux particuliers qui se chargent de l'élevage du poisson dans les étangs d'eaux saumâtres aménagés à cette fin. Une équipe mobile du service d'extension piscicole se rend périodiquement sur place pour faire des démonstrations et donner des avis techniques nécessaires à la population locale.

Les régions atteintes par la marée qui se trouvent le long des côtes du Centre et du Sud Viêt-Nam composées de terrains vagues en friche, des marais salants abandonnés, des zones occupées par la mangrove sont en voie d'être transformées en étangs de pisciculture de *Chanos*.

En vue de démontrer la rentabilité de cet élevage, une station pilote de 18 hectares a été créée en 1959 en pleine mangrove. Cette station dirigée par les moniteurs de pisciculture est à même de fournir à la population environnante et du bois de palétuviers pour la construction de leurs maisons, pour le chauffage, et du poisson pour leur alimentation.

- 5) Avec le développement des zones de culture exploitées par les réfugiés du Nord-Viêt-Nam dans la région des Hauts Plateaux, et les centres de regroupement agricole dans le delta du Sud (agrovilles) la solution du problème du ravitaillement de la population en aliments d'origine protéinique doit être cherchée dans la pisciculture.

Un centre d'alevinage pouvant produire annuellement de 3 à 5 millions d'alevins d'espèces d'eau douce sont en cours de construction à

Pleiku. Une fois achevé, le Centre ravitaillera en poissons les étangs d'élevage des villages des réfugiés et contribuera au repeuplement des cours d'eau et lacs naturels de la région des Hauts Plateaux.

Dans chaque agrovilles du delta, pour subvenir aux besoins urgents de la population rurale nouvellement installée, un étang communal est creusé et stocké en espèces à croissance rapide (ex: *Tilapia*, *Trichogaster*, etc...)

- 6) Jusqu'à une date toute récente, aucune méthode rationnelle de reproduction des espèces d'élevage n'a été pratiquée dans la pisciculture traditionnelle.

Nos paysans se contentaient soit de récolter les alevins dans les cours d'eau pour les espèces qui ne se reproduisent pas dans les eaux closes (ex: Chinese Carp pour le Nord Viêt-Nam et *Pangasius* pour le Sud), soit de laisser certaines autres se reproduire naturellement dans les étangs (comme la Carpe commune, le *Trichogaster* etc...) sans tenir compte de la haute mortalité qui en résulte.

Les stations piscicoles gouvernementales se sont livrées à des recherches appliquées au cours de ces dernières années afin d'améliorer par l'usage des engins perfectionnés la collecte des alevins de *Chanos* et du *Pangasius*, et d'augmenter le rendement du "breeding" des espèces sélectionnées (Carpes communes, *Trichogaster*, *Helostoma*, *Gorami*, etc...)

Dans ce domaine des résultats encourageants ont été obtenus: la quantité d'alevins produite ayant augmenté, la distribution se fait en plus grande échelle et un plus grand nombre de fermiers pisciculteurs reçoivent plus d'alevins d'espèces améliorées pour empoissonner leurs étangs.

- 7) En ce qui concerne des recherches appliquées en matière de pisciculture, nous avons entamé en collaboration avec Dr. Kuronuma, chercheur japonais, des travaux sur :

— le régime alimentaire des principales espèces d'élevage notamment la Carpe commune,

— l'étude du sol des fonds d'étangs de pisciculture au Sud-Viêt-Nam.

— la production économique du zooplancton employé comme nourriture d'alevins.

— les moyens économique pour augmenter la productivité des étangs d'eau à pH trop bas (caractéristique aux sols du Sud-Viêt-Nam)

Tous ces travaux feront l'objet des rapports séparés qui seront communiqués au Comité Technique I de l'IPFC en temps utile.

- 8) Tout effort serait vain et tout programme même le plus parfait, serait voué à l'échec s'il n'existe pas un personnel adéquat pour l'exécuter. C'est pourquoi la formation du personnel technique auxiliaire constitue pour nous un problème qui demande à être résolu d'une façon urgente. Malheureusement le Viêt-Nam ne dispose pas encore d'une institution universitaire pouvant prodiguer un enseignement technique supérieur en matière de Pêches en général et de Pisciculture ou d'Hydrobiologie en particulier. Cette lacune doit être comblée sinon nous manquerons incessamment de cadres dirigeants pour les différents services de Pêches.

Des efforts ont été faits pourtant, mais seulement à l'échelle d'un enseignement technique secondaire: l'Ecole Nationale d'Agriculture, des Forêts et de l'Elevage a institué dans sa section forestière, un cours de Pisciculture générale et spéciale. Les étudiants diplômés de cette section ont été engagés par la Direction des Pêches comme auxiliaires aux différents services techniques. Mais ce cadre s'avère encore incomplet au point de vue de formation spécialisée et demande à être perfectionné pour pouvoir servir d'une façon satisfaisante.

Pour parer au plus urgent, et mener à bien notre programme d'extension de la Pisciculture au Viêt-Nam, nous avons ouvert tous les ans des cours de formation rapide des moniteurs piscicoles que nous envoyons dans les centres de développement agricole et des agrovilles aux fins d'aider la population rurale à pratiquer avec succès la Pisciculture.

C—: Conclusion:

Bien qu'il reste beaucoup à faire pour notre programme de développement de la Pisciculture et des Pêches intérieures au Viêt-Nam, nous sommes en droit de penser que nous y parviendrons dans un très proche avenir, et ce, grâce à nos propres efforts qui visent à produire des poissons en plus grande quantité et en meilleure qualité, mais encore grâce à la bonne volonté de ceux des pays amis qui n'hésitent pas à nous apporter et leur aide matérielle et leur savoir-faire.

Part B

Council's Review of the Report and Recommendations arising therefrom

CONTENTS	Page
I. INTRODUCTION	93
II. PROCEDURE	94
III. WORK PROGRAMME AND RECOMMENDATIONS	95
1. INFORMATIONAL SERVICES, BIBLIOGRAPHIES, REFERENCE BOOKS	96
2. AQUATIC RESOURCES APPRAISAL	96
Tunas	96
Mackerels	96
Chanos	96
Hilsa	97
Mugil	97
Bottom fishes	97
Prawns and shrimps	97
Mollusks	97
3. RESEARCH	98
Standardization of plankton nets	98
Identification of aquatic organisms	98
Oceanography	99
Studies of basic productivity	99
4. MANAGEMENT OF FISHERY RESOURCES	99
River basin development	99
Water pollution control	99
Aquatic weed control	99
Stocking	99
5. FISH CULTURE AND FISH DISEASE CONTROL	99

I. INTRODUCTION

The Council reviewed the Report of Technical Committee I for the Inter-Sessional period, 1959-60, and noted that with respect to Member Countries it constituted a good review of the status of their research and development in the field of fishery research and management with specific reference to the problems and/or recommendations outlined at the 8th Session of IPFC. It further noted that it provided a summary review of FAO's activities and those of the Secretariat in these same fields of concern to the Indo-Pacific Region, again with specific reference to the recommendations made at the 8th Session.

The Council felt that the Report indicated an ever-increasing activity on the part of the member countries, that of the IPFC Secretariat, and FAO.

There was room for more active participation in the work of the Committee, its Panels and the special Sub-Committees by the members, who were official Government nominees. The apparent lack of interest might be due partly to the fact that the 8th Session had addressed few recommendations specifically to the Committee and its allied units. The provision of facilities for better communication between the members could enhance the effectiveness of this work.

The Council noted that certain difficulties had been encountered by Technical Committee I and the Secretariat in compiling and finalizing the Inter-Sessional Report, and it was felt that a disproportionate amount of the Committee's time had had to be diverted from discussion on the programme of work and other technical matters in order to clarify and finalize this report. Upon analysis of the reasons for such occurrence, the Council made a number of observations pertinent not only to the above subject but having additional relevance to other problems of Technical Committee I.

Among the pertinent reasons, the following appeared to be of the greatest importance.

1) A large amount of the material intended for preparation of the Inter-Sessional Report arrived too late to be incorporated into the Provisional Report, IPFC/C 61/WP 6. In part this may be considered to be the fault of some of the Committee members; in part that of the Technical Secretariat.

2) A considerable amount of material which appeared to belong to the Committee's Report was submitted in other forms, for example, as inclusions in "Technical Papers", etc.

3) There was a considerable amount of duplication or overlap in the material submitted by the Committee members. Thus, for example, there might be received from a single country, separate reports from its representatives on Technical Committee I, Panel A and Panel B which not only duplicated information but in some instances were contradictory. Submission on different dates by different Committee units increased this confusion.

The Council further noted that the number of items or problems of interest to the members of Committee I appeared to be growing. It noted the tendency in past reports of inter-sessional work to accord some of the most minor problems a rank or status apparently equal to that of matters of decidedly greater importance. It also noted the retention of items in the programme of work which had, in fact, been matters of only transient interest, or which had already been solved.

The Council further noted that the Inter-Sessional Report did not appear to be primarily a report of the Committee's work but rather a resumé of activities (with respect to limnology, oceanography, fisheries biology, fisheries management and fish culture) carried on by the individual member countries during the past biennium. The Council felt that the resumé was most helpful and should be continued but it called attention to the fact that it was really not a report on the work of the Committee as such.

In considering one more aspect of this complex, the Council felt that it might be desirable to review: the actual structure of Technical Committee I, its two Panels and its associated Sub-Committees; the organization of its work and its system of reporting.

With these thoughts in mind, the Council decided that it would be desirable to counteract all of the above-mentioned undesirable tendencies—inadvertent as they might be—and made the following recommendations towards that end.

II. PROCEDURE

1) A new work programme should be adopted, which—while retaining all the good features of the former ones—would group the various subjects and problems according to only five or six major fields of activity.

A careful choice of these major fields and their continued use as the framework for both work and reporting would ensure a stability of the work programme, promote a better grouping of allied subjects, and enable the addition of new subsidiary topics or the deletion of old ones without disturbance to the major framework. Furthermore it would make reporting far simpler.

The new work programme is outlined below and has been used as the framework for reporting upon the technical aspects of Technical Committees I's work at the 9th Session.

2) The items of work of the two Panels (A and B), as well as those of the Sub-Committees closely associated with Technical Committee I, should not be reported separately in the Inter-Sessional Report but should be grouped under the general field of activity with which they are clearly associated.

Thus, for example, all work on mackerels, clearly the work of Panel B and the Rastrelliger Sub-Committee, would be listed under the heading "Mackerels".

3) To eliminate repetition in reporting and to lessen the number of separate reports which must be examined (by the Chairman of Technical Committee I and the Technical Secretary), and to clarify the method of reporting, the Council recommended the following procedure.

(a) It shall be the function of the Chairman of Technical Committee I, working in close connection with the Technical Secretary, to request each member of Technical Committee I, well in advance of each forthcoming session of the Council, to submit one single report on the inter-sessional activities of his country. This will include the reports of both Panel A and B members and also the Sub-Committee members; that is, each country representative on Technical

Committee I will solicit and receive from his fellow country representatives on Panel A and B and the Sub-Committees, their individual reports. He will combine these into a single report arranged according to the outline of the Programme of Work and submit it to the Chairman of Technical Committee I.

(b) Upon receipt of all these inter-sessional reports, i.e., those from the country representatives, the Chairman together with the Technical Secretary will study them, and prepare from them—again following the outline of the Programme of Work—a summary report of the activities of the Committee, its Panels and Sub-Committees. The Chairman will also send any material relevant to the work of each Sub-Committee directly to the Chairman of the Sub-Committee concerned.

The final report will not confine itself to recom compilations of the work performed by individual countries, but will in fact go beyond this point in including a general stock-taking of individual or collective endeavour, an analysis of trends and, where warranted, suggestions for future work. (The latter may then be considered at the forthcoming Session of the council).

The individual country reports will remain unchanged by the Chairman and Secretariat, except perhaps for minor editing, and shall appear as appendices to the Inter-Sessional Report by the Chairman.

4) This report including its appendices (which will not exceed the total number of Member Countries and the several Sub-Committees) should be completed well in advance of each forthcoming session, issued as a Working Paper, and examined, if possible, by the Council members prior to the Session. A minimum amount of the time of the Committee should be devoted to its revision at the Session, itself, and this time should be confined to the revision of the Report itself and not of the appendices.

The Council further recommended for consideration at the 10th Session that the Chairman of Panels A and B and the Rapporteur be elected for the Session only.

III. WORK PROGRAMME AND RECOMMENDATIONS

There follows an outline of the revised work programme.

WORK PROGRAMME

MAJOR FIELDS OF ACTIVITY FOR TECHNICAL COMMITTEE I

1. INFORMATIONAL SERVICES, BIBLIOGRAPHIES, REFERENCE BOOKS

- (a) Information—generally.
- (b) Bibliographies.
- (c) Reference books.

2. AQUATIC RESOURCES APPRAISAL

- (a) Country and regional appraisals, reviews or synopses.
- (b) Appraisals, surveys or synopses of marine areas or of river basins (inland) or individual waters (inland).
- (c) Appraisals or inventories of fish populations.
- (d) Reviews or synopses of aquatic forms of economic importance, with special reference to the following :

Tunas	<i>Mugil</i>
Mackerels	Bottom fishes
Sardines	Prawns and shrimps
<i>Chanos</i>	Mollusks
<i>Hilsa</i>	Marine algae

3. RESEARCH, INCLUDING DEVELOPMENT OF METHODOLOGY AND TECHNIQUES ON CERTAIN SPECIALIZED SUBJECTS RELATING TO FISHERIES

- (a) Standardization of equipment and methods of assessment of plankton populations.
- (b) Identification of aquatic organisms.
- (c) Population dynamics, age determination, fish behaviour, and related studies.
- (d) Oceanography.
- (e) Study of basic productivity.
- (f) Aquatic ecology.

4. MANAGEMENT OF FISHERY RESOURCES IN NATURAL WATERS

(Including Reservoirs)

- (a) Regulatory (legislative) measures.
- (b) Control or alteration of the physical features of the environment
 - (i) River basin development.
 - (ii) Others.
- (c) Control or alteration of the chemical features of the environment
 - (i) Water pollution control.
 - (ii) Use of fertilizers.
- (d) Control or alteration of the biological features of the environment
 - (i) Aquatic weed control (See also under 5 (e)).
 - (ii) Others.
- (e) Stocking
 - (i) Maintenance stocking and transplantation.
 - (ii) Introduction of non-indigenous species. (See also under 5 (h)).

5. FISH CULTURE AND FISH DISEASE CONTROL

- (a) Fish culture—general.
- (b) Nutrition.
- (c) Pond fertilization.
- (d) Studies of fish breeding, including genetics.
- (e) Aquatic weed control (See also under 4 (d)).
- (f) Handling and transport of fish seed.
- (g) Disease and parasite control.

- (h) Studies of non-indigenous fishes (see also under 4 (e)).
- (i) Economics of fish culture.
- (j) Special forms of aquiculture; e.g., rice-field fish culture; shrimp culture; brackish water fish culture; oyster culture, etc.

6. MISCELLANEOUS PROBLEMS OFTEN SHORT TERM

As a result of the adoption of this general work programme, the Council proceeded to its discussion, and made certain observations and recommendations which follow. (The order of arrangement is that of the work programme).

1. INFORMATIONAL SERVICES, BIBLIOGRAPHIES, REFERENCE BOOKS

Information—Generally

The Council urged Member Governments to request the appropriate institutions in their countries to send publications to IPFC who will list them in a suitable medium for distribution.

The Council requested FAO to urge institutions and journals to standardise the form of published papers on fisheries to include institutional and current addresses of authors.

The Council urged Member Governments to request the appropriate institutions in their countries to furnish FAO with adequate particulars concerning their workers in the field of fisheries.

The Council recommended that FAO should furnish on request short lists of workers in specialised subjects.

Reference books

The Council recommended that priority be given to the publication of the Manual on Sampling Methods in view of its wide application to problems in the Region.

2. AQUATIC RESOURCES APPRAISAL

Tunas

The Council urged Member Governments to increase activities in this field and to furnish reports, concerning their current and planned research on the biology of tunas to the IPFC Secretariat (by January 1962) so that they may be combined into a summary for the Indo-Pacific Region as a contribution to the World Scientific Meeting on the Biology of Tunas and Related Species.

Mackerels

The Council urged Member Countries concerned to continue more vigorously or initiate work on population studies of Rastrelliger as defined in the programme of the Rastrelliger Sub-Committee.

The Council recommended that the programme on Rastrelliger should be as laid down by the Rastrelliger Sub-Committee, i.e.

- i) Tagging.
- ii) Survey of spawning grounds and spawning seasons.
- iii) Age determination.
- iv) Food and feeding habits.
- v) Schooling behaviour.
- vi) Catch statistics and fishing effort.

The Council requested participating countries to send records of length sampling operations to the Chairman of the Rastrelliger Sub-Committee, who will collect this material and then refer it to the Council Secretariat for publication as an IPFC Occasional Paper.

The Council recommended that a meeting of workers in the form of a "Workshop" on Rastrelliger, at which results could be compared and discussed, should be held in Malaya as soon as possible under the Technical Assistance Programme. (see Ch. I, p. 31).

Chanos

The Council, while noting with approval work performed by Governments on research and developments of the *Chanos* fisheries, wished to express disappointment on the number of contributions to the 9th Session concerning *Chanos* and urged much fuller reporting at future Sessions.

The Council recommended that Member Governments carry out investigations and send in reports to the 10th Session concerning the propagation of *Chanos* in confined waters.

Hilsa

The Council urged Member Governments concerned to afford greater facilities for *Hilsa* research, if necessary with outside assistance, and also urged that the participants in the investigation be afforded greater opportunity for meeting and co-operating under the programme as laid down by the *Hilsa* Sub-Committee.

Mugil

The Council appreciated Mr. J.D. Bromhall's offer to turn over a considerable amount of material which he has collected on *Mugil cephalus* to C.S.I.R.O., Australia, in order that this Organisation prepare a synopsis according to the pattern now being used by Fisheries Biology Branch of FAO in its series FAO Fisheries Biology Synopses and urged members to submit further contributions to this work.

The Council appreciated the response of the Government of Korea to the request reported in the Proceedings of the 8th Session of IPFC concerning the experiments on artificial breeding of *Mugil*, and recommended similar studies to other countries.

Bottom fishes

The Council recommended that greater attention should be paid to bottom fishes, especially to those of commercial importance.

Prawns and Shrimps

The Council recommended that a Sub-Committee be set up to pay special attention to the research on and culture of prawns and shrimps, and that Member Governments should be asked to nominate members to this Committee.

The Council recommended the setting up of an *ad-hoc* Sub-Committee for the interim period in order to prepare the work for the official Sub-Committee composed of members to be nominated by Member Governments. The follow-

ing members of the interim *ad-hoc* Sub-Committee were appointed:

Mr. H. Saanin	(Indonesia)
Mr. Soong Min Kong	(Malaya)
Dr. Nazir Ahmad	(Pakistan)
Dr. B.S. Bhimachar	(India)

Mollusks

The Council noted that almost the whole of the world production of nacre and of natural pearls is centered in the Indo-Pacific region, which also possesses exclusively the cultured pearl industry.

Although the production of nacre is menaced by the competition of synthetic materials, the pearl market, on the other hand can assure the future of the oyster pearl fisheries, if, by increasing, in the case of natural pearls, their production by multiplying the pearl beds, and in the case of cultured pearls, by developing the industry utilising both marine and fresh water mollusks, production of pearls can be maintained and increased.

The Council further recognised the importance of the natural fisheries for edible mollusks and of the culture of certain species notably the edible oyster.

The development of research in this domain concerns most Member Governments but there does not exist at present, any direct liaison between them in this connection.

The Council urged interested Member Governments to prepare reports on the present status of the pearl oyster fisheries which should include the following points:

- a. the stock inventory on pearl oysters,
- b. measures of protection of the natural beds,
- c. the stage of research work,
- d. the development projects,
- e. steps being taken to meet with the competition of synthetic materials.

The reports should be forwarded to the Chairman of Technical Committee I for presenta-

tion at the next Session of the Council which might then draft a common programme of work.

The Council recommended that FAO furnish a list of workers especially interested in pearl oysters, trochus and other nacreous mollusks of commercial interest (mollusques nacriers et perliers.)

The Council would also urge interested Member Governments to send publications or lists of publications on this subject to the IPFC Secretariat for distribution to interested members.

3. RESEARCH, INCLUDING METHODOLOGY AND TECHNIQUES ON CERTAIN SPECIALIZED SUBJECTS RELATING TO FISHERIES

Standardization of plankton nets

The Council recommended at the 8th Session that Member Governments conduct experiments with the Marutoku B-type net during the inter-sessional period.

Consideration of the results of such experiments together with the whole problem of plankton sampling makes it difficult to specify a standard plankton net at this time. These difficulties are of several kinds and relate to the variety of objectives of plankton work and to the conditions under which the work is done.

Aside from the conduct of general surveys, collections of plankton ordinarily are made to obtain samples of fish eggs and larvae, to measure the standing crop of zooplankton, and that of phytoplankton. Within the Indo-Pacific region, variations in the density of planktonic organisms in general and of some of those to be sampled in particular, such as fish larvae, are so great that several net sizes may be desirable if sampling is to be both efficient and adequate.

In addition the pattern of tow cannot be standardized for all purposes; the distributional pattern of the organisms sampled must be considered. Tow patterns ordinarily used are the vertical haul from some depth to the surface, the oblique haul and horizontal haul, which is usually made just beneath the surface of the water. The

time of the haul is also of importance, the diurnal migration of many planktonic organisms will affect the character of the catch in respect to time of day or night.

For these reasons the Council felt it impractical to recommend a particular net or pattern of use exclusive of all others. The results obtained with the Marutoku B-type zooplankton net were noted as reported in Annex A to IPFC/C61/WP6 and in IPFC/C61/WP42. In view of these results the Council is reluctant to recommend this net as the standard net for zooplankton sampling. It is not suitable for sampling tuna larvae in the Central Pacific as noted in IPFC/C61/WP6, page 3. However, note was taken of the satisfactory use of this net as reported in IPFC/C61/TECH 30.

The Council recommended that member countries inform the IPFC Secretariat of the general kinds of planktonic organisms of interest and the nets employed in sampling them. The information concerning these nets should include diameter of the mouth, length of the net and mesh size in both the body and the cod end. The pattern of use should also be described including type of haul, whether oblique, vertical or some other, depth, towing speed and time of day. The volume of water ordinarily strained, as measured by a flowmeter, should also be given. Such information, together with comparison tows of various kinds of nets may make some intercomparison of plankton catches feasible. This information should be deposited with the IPFC Secretariat where it would be available on enquiry to other investigators contemplating a programme involving the collection of plankton.

Identification of aquatic organisms

The Council noted the progress of its members in compiling check lists of aquatic organisms, especially fishes, and preparing taxonomic publications and bibliographies. It again urged Member Governments to send all new and revised papers on the subject to the Biology Branch, Fisheries Division, FAO, in order that a comprehensive listing of scientific and common names of major species of aquatic organisms of economic importance, including those in the Indo-Pacific Region, shall be compiled.

Oceanography

The Council, in recognising the importance of oceanographic studies to fisheries, drew the attention of Member Governments to the work of the International Indian Ocean Expedition and urged member countries to take advantage of the opportunities afforded.

Studies of basic productivity

The Council drew the attention of members to the Symposium on the subject of Basic Productivity to be held at the 10th Pacific Science Congress, August 1961, and recommended that full advantage be taken of the deliberations of the Symposium.

4. MANAGEMENT OF FISHERY RESOURCES IN NATURAL WATERS (Including Reservoirs)

River basin development

The Council referred to the recommendations made at its 8th Session concerning the Lower Mekong Basin Development Project, and emphasized the need for a thorough fisheries survey as an integral part of the overall plan. In view of the far-reaching consequences of the scheme on the fisheries of four countries the Council urged that the development of fisheries resources should be accorded a proper place in the development plan.

Water pollution control

The Council reiterated its recommendation made at the 8th Session concerning water pollution and drew the attention of Member Governments to the Conference on Water Pollution Problems in Europe to be held in Geneva in 1961, and urged that such literature emerging from the Conference which has application to the Region be carefully studied.

Aquatic weed control

The Council recommended to Member Governments that all information on the use of fish for the control of aquatic weeds be provided to FAO for compilation and distribution.

Stocking

The Council again drew the attention of Member Governments to the danger inherent in the indiscriminate introduction of non-indigenous species of fish and requested members of the Council to evaluate the consequences of such introductions to their own countries and to submit reports on this subject at the next Session.

5. FISH CULTURE AND FISH DISEASE CONTROL

The Council felt that insufficient attention had been paid to the important problem of pond fish nutrition and urged Member Governments to initiate and develop such studies and also to forward all relevant information to the IPFC Secretariat for dissemination.

The Council waited with further interest the results of research on the spawning of Chinese carps and urged that similar work be carried out on the Indian and other carps of commercial importance. The Council noted that work had commenced on selection and improvement of *Tilapia mossambica* and *Puntius javanicus* and recommended that similar work be carried out with other species.

The Council requested FAO to gather together information concerning the use of anesthetics and tranquilizers in the handling and transport of fish and further requested Member Governments to submit relevant information in their possession.

In view of the need to control the spread of fish diseases and parasites between countries the Council recommended that Member Govern-

ments and FAO furnish all relevant information to the Council at its 10th Session.

The Council noted the small amount of information on the different aspects and problems of fish culture in rice-fields received by the Sub-Committee during the inter-sessional period and suggested that a greater participation of the members would be desirable.

It was suggested that the Sub-Committee should obtain more information from member countries, especially with respect to:

- a) Comparative figures of the production of rice in paddy fields where fish culture is practised and where it is not.
- b) The rate of production of fishes, including that for each species.

- c) The effect of fertilisers.
- d) The estimated increase in income to the farmers.
- e) A review of the methods of obtaining fry in those situations where artificial stocking is carried out.
- f) The proportion of fish, in terms of weight, consumed by the farmers and the proportion sold or bartered in village markets.

Further, in view of the interdependence of rice-planting and rice-field fish culture it was recommended that in those countries where such fish culture is practiced, a closer cooperation should be achieved between the different national agencies directly concerned with the matter e.g. Agriculture and Fisheries.

CHAPTER III
CRAFT AND GEAR

Part A

*Report of the Inter-session Activities (1959-60) of
Technical Committee II, Panels A and B*

CONTENTS

	Page
INTRODUCTION	103
1. CRAFT	103
1.1 Improvement of Craft.	103
1.11 Design and Construction.	103
1.12 Mechanized Beach Landing and/or Surf Boats	106
1.2 Mechanization of Fishing Craft	106
1.21 Progress of Mechanization	106
1.22 Engines.	112
1.221 Types, Makes, Prices, and Fuel	112
1.222 Servicing Facilities	116
1.223 Indigenous Production.	116
1.224 Government Assistance	116
1.23 Effects of Mechanization.	117
1.231 Extension of Fishing Grounds	117
1.232 Fish Catch	117
1.233 Fisherman's Earnings	118
1.234 Employment	118
1.3 Training for Boatbuilders	118
1.31 Appointment of Craft Technicians	118
1.32 Training Boatbuilders in Modern Carpentry Work	118
1.4 Fishing Ports	119
2. GEAR.	120
2.1 Mechanized Handling of Gear	120
2.11 Use of Line Haulers, Winches, Capstans, etc.	120
2.12 Effect on Employment	121
2.2 Improved Types of Gear	121
2.21 Attraction of Fish (by light, etc.)	121
2.22 Improved Traditional and New Types of Gear	121
2.23 Detection of Fish	123
2.24 Use of New Materials.	123

	Page
2.241 Synthetic Fibers, Floats, etc.	123
2.242 Government Assistance	126
2.3 Supply of Fishing Gear	126
2.31 Production by Traditional Methods	126
2.32 Import Policy	126
2.33 Fishing Gear Factories	126
2.4 Preservation of Fishing Gear	127
2.5 Weather Forecasting	127
2.6 Fishermen's Training	127
2.7 Research Activities	131
2.71 Research Institutions	131
2.72 Research Programs	132
3. DOCUMENTATION	134
3.1 The Second World Fishing Boat Congress	134
3.2 Otter Trawling	134
3.3 Symposium on Improved Types of Fishing from Small Boats	134
4. PERSONNEL OF THE FAO REGIONAL OFFICE FOR ASIA AND THE FAR EAST	134

CHAPTER III

CRAFT AND GEAR

Part A

Report of the Inter-session Period (1959-60)
by Technical Committee II, Panel A

INTRODUCTION

During its Eighth Session held at Colombo, Ceylon, 6-22 December 1958, the Council reviewed the developments in the fishing industry in the various countries of the Indo-Pacific Region and made several recommendations directed both to the Member Governments as well as to FAO. These recommendations covered various aspects of the fishing industry such as fishing craft and gear, preservation, processing, distribution and marketing of fish, fisheries statistics as well as fisheries socio-economics.

This report deals mainly with the actions taken by the Member Governments as well as by FAO on the above recommendations of the Council. In the preparation of this report, the Secretariat of the Technical Committee relies mainly on the information contributed by the members of the appropriate Panels of the Committee as well as on information supplied by the Council Secretariat on the actions taken by FAO. Also, information gathered by the Technical Secretaries, by personal discussions with the appropriate Panel members as well as by inspection of fisheries establishments, during their visits to the member countries, are included.

As is the usual practice, the promotion of the activities of the Technical Committee and its Panels is generally done by taking up the recommendations made by the Council, with the Panel members of the Committee, while the recommendations made to FAO are taken up by the Council Secretariat with that Organization. Contacts with the members of the Committee are established by issuance of circular letters as well as by personal visits by the Technical Secretaries to the member countries, if adequate travel funds become available.

1. CRAFT

1.1 Improvement of Craft

1.11 Design and Construction with Due Consideration of Economy

In *Ceylon* the main program centres around the introduction of western type boats fitted with inboard Diesel engines. The most common boats are to the design of one of the bigger boat yards in the island, the length originally being 26 ft. which in more recent boats has been increased to 28 ft. The FAO naval architect attached to the country has recently designed a 26 ft. boat of sturdy construction and greater capacity. A few boats to this design have been built and the first operational reports have been very encouraging. A few boats of 34 ft. length have also been constructed.

In *India*, new types of boats of 24 ft. 7 in. and fitted with the 10 h.p. engine and 32 ft. boat fitted with the 38 h.p. engine have been designed by an FAO Naval Architect. These types of boats have been found to be quite suitable for various methods of fishing such as shrimp trawling, gillnetting, driftnetting and line fishing. Due consideration has also been given while designing these boats to make the construction as cheap as possible. Another FAO Naval Architect has recently designed three types of boats, a 25 ft., 30 ft. as well as a 32 ft. transom stern trawler. The 25 ft. boat will be fitted with a 10 h.p. engine while the other two boats were fitted to 30 to 40 h.p. engines. Trials have already been made with these boats and have been satisfactory. The necessity for designing new types of craft arises from the fact that the indigeneous crafts are not suitable for mechanization.

With increasing interest in the mechanisation of fishing craft, new designs are being developed not only in coastal areas, where the existing boats cannot take the engine but also

in other areas where the necessity for increasing the efficiency of the boats for better earnings has led to modification of the existing designs. The work relating to the designs of fishing craft is closely coordinated with the Craft and Design Section of the Central Fisheries Technological Research Station, Cochin. An FAO Naval Architect is assisting this programme. It is now proposed to draw the details of the designs suitable for different regions and for different types of fishing in the country and release them to the benefits of the fishing industry at a nominal cost.

During the two years prior to the 9th Session, many changes have taken place in various aspects of fishing craft and gear in *Japan*. Of these changes, specific attention should be given to the fact that fish hold capacity has increased in tuna longliners. A new type of tuna longliner, which will carry over 10% more fish than previous types of the same size, has been designed. This has been necessitated by the increased prospects of salmon fishermen coming into the tuna fisheries as a result of the reorganization of the North Pacific fishery, and this has increased the price per ton of tuna boats considerably. For this reason, tuna boats with a higher fish capacity in proportion to gross tonnage, have been designed. A 250 gross ton vessel has been designed and is stated to have the fish holding capacity of a 300 ton vessel. The older type 250 ton tuna boats have a capacity of only 148 to 152 tons while the new vessel will have a fish hold capacity of 168 tons. The latter will also have a freezing capacity of 8 tons per day as compared with 3 tons for usual boats of this tonnage. While the increased price per ton of tuna boats which salmon fishermen from the northern North Pacific had to pay in joining the longline fishery is one of the reasons for improvement of fish capacity another factor and perhaps more essential one, is thought to have been development of new designs of engines for fishing craft in general. Use of supercharger has made it possible to introduce a smaller sized engine with a higher horse power, thus reducing the space of engine room and increasing the capacity of fish hold by that space. Further contributions given to this innovation were im-

provement of insulation material and upholstery techniques for fish hold along with overall use of welding system for construction of boats.

In *Korea*, plans for an improved medium size fishing vessel have been developed. This vessel is a multipurpose boat which can be used for various types of fishing. The principal dimensions are as follows: length, h.p., 22.00 m.; breadth (molded), 6.00 m.; depth (molded), 2½ m. The boat will be powered with a 250 h.p. engine and is equipped with a boom-tip powerblock. There are some 142 shipyards ranging from simple beaching facilities to modern installations for wooden and steel shipbuilding. The wood (Douglas fir, etc.) is imported from U.S.A. Only wooden ships from imported wood are constructed (capacity 9 boats of 25 tons each).

Immediately after the liberation and especially after the Korean war, the fishing fleet suffered seriously from a shortage of repair and operating supplies. A shortage of boat lumber, engine parts, sail canvas, nets and manila rope were the most serious handicaps to the fleet operations. Boat paints, nails, wire rope, and other supplies have been needed in large quantities. Domestic production of boat supplies has been very low, largely because of the lack of raw materials. Fuel and lubricating oils have been occasionally in short supply. But, supply has been fairly good most of the time lately because those materials and equipment have been procured from abroad along with other supplies and manufacturing facilities by the foreign economic assistance agencies such as UNKRA, FAO, and ICA.

Within the scope of the sea fisheries development program in *Netherlands New Guinea* a project regarding the use of six small motor-driven vessels was submitted. With the use of these vessels and in co-operation with the population, it was the intention to establish experiment stations for the exploitation of neglected fishing grounds by means of the present or new catching techniques.

The construction of the aforesaid craft was entrusted to the Fisheries Branch of the Department of Economic Affairs, which is also responsible for the development of the project.

The prototype was launched in the middle of 1959 and was submitted to speed and stability tests under smooth and rough conditions. The test results furnished no ground for any change in the design. Early in 1960 two more vessels were launched and it is expected that the other craft will be finished early in 1961.

Dimensions of the Vessels

Length overall	8.40 m.
Beam	2.40 m.
Draft	0.84 m.

Fish hold capacity 1.03 m³ (= 1.03 tons)
The vessels have a flush deck and an insulated ice and fish hold, and are equipped with a Victor Vixen opposed twin cylinder 14-24 h.p. marine Diesel engine.

Shrimp trawlers, hitherto unknown, have of late gained popularity in *West Pakistan*. Approximately 40 trawlers and an equal number of improvised beam trawlers are now actively engaged in shrimping. These trawlers are locally built and range in size from 30 ft. (9.14 m.) to 75 ft. (22.86 m.) (in length). They have full deck in one level, wheel-house, a crew cabin, an inset rudder coupled to a wooden steering wheel, insulated fish hold, power operated trawl winch and deck gear for stern trawling. A new development towards building these trawlers suitable for gill netting as well is now under way. To achieve this, the cabin is located in the centre leaving the forepart for gill netting and the aft-part for trawling.

Main dimensions of a typical trawler cum gill netter are given below :—

Length, overall.....	55 ft. (16.76 m.)
Length, waterline....	49 ft. (14.93 m.)
Moulded breadth....	16 ft. (4.87 m.)
Depth.....	8 ft. (2.44 m.)
Main draft loaded....	4 ft. (1.22 m.)
Hold capacity.....	10 tons.

The *Malayan* marine fisheries which was primarily a primitive industry of the sea faring Malay since earliest times has undergone many changes through the impact of foreign civilisa-

tions that have passed through this land and left their influences. From the primitive riverine rattan traps, the Malays have developed large sea-traps of stakes and rattan screens that head the fish into enclosures or cut them off into shallow water while Hindu influences in the 13th and 14th centuries saw the introduction of twine, enabling the manufacture of drift-nets, drag-nets, lift-nets, and fixed purse seines. Later some types of nets were copies from Portuguese and Chinese models which altogether have brought about a cosmopolitan character to the Malayan fishing industry.

Today, the size of the industry is considerable, employing about 50,000 fishermen and landing some 125,000 tons of fish annually. With the aid of Western science and the demands of a fast increasing population, its growth is therefore inevitable.

Fishing crafts in use are mainly of two types, (i) the long and narrow boats with a shallow keel especially designed for speed and day fishing as used by the Malays and (ii) the heavier and deeper Chinese boats that can stay out at sea for several days or weeks. As there are two distinct racial groups of fishermen each following its own traditional methods in craft design and fishing methods, improvements have not been uniform, the main reasons being one of economy and deep rooted traditional beliefs.

No major revolutions in craft design have been attempted as yet, although minor variations have been made as regards underwater surfaces for improved flow to and from propeller and proper engine installation. Apart from these, design and construction of fishing craft still follow traditional lines.

The problem of the indigeneous crafts not being suitable for mechanization, does not exist in *Hong Kong*. But for higher efficiency in every respect, a lot of improvements on these indigeneous crafts have been done, an example of which is trying to convert the existing pair trawling junks into single boat stern trawlers. This development is coming forward. Two trawling junks already changed their operations of pair trawling into single boat side trawling first. The single boat stern trawling is the answer for them in consideration of economics.

The Fish Marketing Organization in *Hong Kong* is considering to build a 65 feet length overall wooden stern trawler of modern design. The Fisheries Division of the Co-operative Development and Fisheries Department will design the vessel and supervise the work during construction. This will be a new type of fishing vessel introduced to the local fishermen recommended by the Fishing Master of the Fisheries Division.

1.12 Mechanized Beach Landing and/or Surf Boats

In *Ceylon* further work on a beach landing boat has been temporarily suspended. Delegates to the last meeting of the council in Colombo were given a demonstration on beach landing as an example of the type of investigation that was intended in this country. Work subsequent to the meeting did not give encouraging results and it was decided to lower considerably the priority to this project particularly in view of the urgent need for an early increase of production. It considered desirable to concentrate instead on the introduction of non-beach-landing boats which could operate from existing harbours and shelters.

In *India*, a program for beach boat trials was organized during October 1959 - April 1960. Tests and trials were to be carried out at Tuticorin, Orissa and off Kerala State. The main points to be considered at the trials are (i) State of training of fishermen participating, for handling beach boats at sea, in breakers and on the beach (ii) Suitability of various boat types for intended future work (iii) Selection of prototype design (iv) Extension of the introduction of beach boats. A full report of the results of the trials is not yet available. The actual program of work consists of (i) training fishermen in handling beach boats in breakers and on beach; (ii) all possible ways of handling and take-off will be tried; (iii) all possible ways handling the boat on the beach such as manual handling, handling with hand winch and mechanical winch; (iv) testing of boat in light condition and under ballast representing fishing gear and catch to give conclusions as to the location of the center of gravity for optimum performance; (v) to as-

certain the suitability of different boats; (vi) study of the changes in the designs; (vii) study of the performance of the engines.

The problems relating to beach landing and surf boats have been engaging the attention of the Government of India for the last few years and the results of the Government-organised surf-boat trials in collaboration with the FAO and the Indo-Norwegian Project and the State Governments of Kerala, Madras and Orissa have already been compiled in the form of a report. A copy is available with the Secretariat.

The investigations on the beach boat trials are of particular interest to most of the under-developed countries in the region. The report deals with the types of boats used under different beach, weather and sea conditions. The training programmes were completed in advance so as to have a better coordinated approach in the handling of the boats in the varying conditions. The report deals with hull-shape and construction, handling of the boats in the sea and on the beach, engine types, engine power, engine installation, propellers and drives, shafting and bearing and pumps. The types of equipment required for beaching were also referred to.

Based on the results of these trials, it has been recommended that pilot projects should be undertaken in a coordinated manner for assessing the economic feasibility of the small beach boats in the country.

1.2 Mechanization of Fishing Craft

1.21 Progress of Mechanization

In *Ceylon*, the progress of mechanization has been quite satisfactory. About 500 mechanised boats are in operation at the present date and it is expected that there will be 1000 boats at the end of 1961. The great majority of these boats are of the 26 ft. type and have been introduced under the Government financed hire purchase scheme.

Except in the north of the Island, jak is being used universally for planking and two serious problems have been encountered. The first has been the result of the increased demand for mechanised boats with which the safety of

job for planking cannot keep step. Insufficiently seasoned timber is being used and complaints of poor planking and leaks are frequent. The second problem is that of very serious damage by marine borers which has led to insistence on copper sheeting for all boats issued under the government scheme.

Much trouble has also been experienced with stern bearings and propellor shafts and studies are being made as to how breakdown from those causes can be reduced to a minimum.

Several makes of engine are in use, a fair proportion being from Japan and the U.K. It is possible that minimum efficiency is not being obtained from any engine on account of standard propellers being used irrespective of the design of the boat. This in some measure would account for horse powers ranging from 8 to 22 being in popular demand. There is an indication of preference for water cooled engines over the air cooled when considerations of finance do not bias the selection.

The basic cost of a 28ft. hull is Rs.8500/— to which has be added Rs.1175/— for copper sheeting. Under the government scheme gear up to

Rs.2000/— is an essential requirement now and this is usually used for the purchase of 20 sets (100 hooks) of floating long line. Nylon drift nets are also used from these boats.

The *Government of India* set up an *ad hoc* Fisheries Enquiry Committee for enquiring into, reviewing and assessing the difficulties of fishing industry in relation to the existing rules and regulations applicable to the motorised fishing vessels and formulating specific rules for fishing vessels. This Committee submitted its report to the Government of India in 1959 along with necessary recommendations for improvement of the mechanised fishing craft and also for providing facilities for mechanised fishing programmes. A copy of the report had already been sent to the IPFC.

Considerable changes due to economic and social reasons have taken place in the structure of *Japanese* fishing industry which may be represented by relative scales and distribution of various types of fisheries. The number of fishing boats was about 400,000 as of 1958. Of those, 60 per cent was non-powered vessels of less than one gross tons.

Number of Japanese fishing fleets, 1956-58*
(Unit of number : 1,000 boats)

Year	Non-powered boat		Powered boat		Total
	Number	%	Number	%	
1956	264	63	152	37	416
1957	245	61	157	39	403
1958	234	59	165	41	399

* Includes a minor portion of boats in inland water fisheries.

Eighty-five per cent of powered boats were no larger than 5 tons. This means that the former had a notable decrease, while the latter—particularly boats under 3 tons—an increase, from the level in 1957, respectively. Along with the decrease of non-powered boats, an increase of powered boats under 3-ton class took place in 1958. A decline in number was also noticed for powered boats ranging from 5 to 20 tons.

Number of powered fishing boats in Japan, 1956-58*
(Unit of number: 1,000 boats)

Year	Under 5 tons		5-20 tons		20-100 tons		Over 100 tons		Total
	Number	%	Number	%	Number	%	Number	%	
1956	123.3	82	18.8	13	6.7	4	0.8	1	149.9
1957	128.2	83	18.3	12	6.8	4	0.8	1	154.5
1958	136.1	84	17.8	11	7.0	4	0.9	1	162.1

* Excludes a minor portion of boats in inland water fisheries.

In 1959 the decrease in non-powered boats was not so remarkable as it had been in the previous year, with the rate of decrease remaining at about 35% of the level in 1958. Mechanization of small craft was about 15% increase over the level in 1958.

In a general trend it is obvious that mechanization of non-powered boats is more prevalent in those crafts under one-ton class than in those ranging from one to 5-ton classes. On the other hand, the number of powered boats larger than 200 gross tons showed a considerable increase in contrast with a sharp decrease in medium sized boats belonging to 5- to 20-ton classes. When computed on the basis of boats larger than 200 tons, the average capacity is 1,100 gross tons; based on boats larger than 500 tons, it has come as large as 2,690 gross tons per fishing boat.

There are more than 38,000 fishing boats in Korea with an aggregate tonnage of more than 119,000 GRT. Of these about 4,900 boats with a total of about 54,000 GRT are powered while about 33,000 non-powered boats account for only about 65,000 tons. The largest proportion (75%) of non-powered boats are below 3 tons GRT while about 64% of the powered boats are in the range 4 to 20 tons GRT, the larger proportion being in the range 4 to 10 tons. There are more than 250 powered boats of more than 50 tons GRT. Most of the larger (more than 50 tons) powered boats operate from Inchon (104), Pusan (84) and Yosu (65).

During last year's typhoon much damage has been done to the fishing boats operating from Pusan which resulted in the total loss of 36% of the fishing boats. Of this 14% comprised powered boats and the rest non-powered boats.

*Fishing Boat in Korea
(1945 - 1959)*

Year	Power Boats			Non-Power Boats		Total		
	No.	Tonnage	H.P.	No.	Tonnage	No.	Tonnage	H.P.
1945						43,392		
1946						48,837		
1947						48,177		
1948						46,774		
1949						46,230		
1950						42,107		
1951						43,203		
1952	3,361	32,033	72,142	37,882	80,105	41,244	112,138	
1953	3,297	30,173	67,462	37,231	72,710	40,528	102,882	
1954	3,745	38,732	101,946	38,983	78,530	42,728	117,262	
1955	4,141	52,348	103,113	35,378	73,233	39,520	125,581	
1956	4,623	52,938	116,246	35,011	64,155	39,634	117,093	
1957	4,598	52,241	112,004	33,154	53,105	37,752	105,346	
1958	5,891	62,015	133,019	32,241	48,390	38,132	110,405	
1959	3,978	52,216	118,197	24,913	37,204	28,891	89,420	

In the *Federation of Malaya* there is a conscious response to mechanisation of the fishing fleet and gradually the light sailing boats are being replaced by heavier mechanised crafts. Outboard engines are being installed on existing crafts by improvisation of 'brackets' to fit the engines. More and more of these crafts are being

modified to use inboard Diesel engines and during the years 1958 and 1959 there has been a notable increase in the use of inboards.

Table below shows comparative figures of the powered and non-powered crafts in use by fishermen in *Malaya*.

Fishing Boats in Federation of Malaya
(1947 - 1959)

Year	Non-powered	Inboard	Powered Outboard	Total
1947	16,101			114
1949	21,993			327
1951	20,196			707
1953	21,037			1,570
1955	18,879	603	3,947	4,550
1956	17,730	996	4,645	5,641
1957	17,541	1,541	4,742	6,283
1958	17,749	2,284	5,012	7,296
1959	14,379	3,123	4,761	7,884

Engines

Engines of Japanese, German, British, American, Swedish and Norwegian manufacture are in use. They include the following:

<i>Outboard</i>	<i>Inboard</i>
Johnson	Petter
Seagull	Yanmar
Mercury	Daiya
Evinrude	Kobuta
Penta and Achimedes	Lister
	Bolinder
	M.W.M.
	Deutz
	South Iron
	Bukh
	Coventry Victor
	Ailsa Craig
	Sabb (semi Diesel)
	Enfield

With such a wide choice of engines available prices based on horse power alone is difficult to quote, besides such features as stern gear, fuel tanks etc. do not in any way simplify the problem of quoting the 'standard type' of engine used.

However, the following prices are guides to the selection of inboard and outboard engines based on H.P. as given by importers.

All prices quoted are in Malayan dollars

Outboard engines

2½ to 3 H.P.	range varies from	\$535 to \$630
4 H.P.	" " "	455 to 960
5 to 6 H.P.	" " "	810 to 640
7 to 8 H.P.	" " "	920 to 1040
10 H.P.	" " "	1100 to 1165
12 H.P.	" " "	1165 to 1420

Inboard engines (with reverse/reduction gear, fuel tanks, stern gear, etc.)

3 to 4 H.P.	range varies from	\$1250 to \$1300
6 H.P.	" " "	1850 to 2600
7 H.P.	" " "	1500 to 2075
8 H.P.	" " "	2800
9 H.P.	" " "	1695 to 2615
10 H.P.	" " "	2950
12 H.P.	" " "	3500 to 3550
20 H.P.	" " "	4850 to 6495
27 to 30 H.P.	" " "	6100 to 8055

Most dealers give a discount of between 10% to 17½% on the listed price.

M\$1/— = 2s. 4d.

The progress of general developments in the urban centres has exerted a favourable influence on the fishing industry of *Netherlands New Guinea*. In particular the circumstances of limited landings and increased purchasing power have stimulated the mechanization of the dug-out type vessels by means of outboard motors.

In *Hollandia*, the capital of *Netherlands New Guinea*, fisheries are prosecuted by some 150 fishermen, operating about 100 craft, including 40 motor-driven vessels. The Monokwari fishing industry is operating 10 motor-powered craft.

To give further incentive to private fish industry, the Government of *Pakistan* have reduced by 12½%, the current prices of 155 marine Diesels imported for development of fish industry. These engines are being distributed all over *Pakistan* i.e. at Chittagong, Cox's Bazar, Khulna, Pasnie, Gwadur and Karachi. Two ocean going motor boats constructed at Chittagong by the

Central Fisheries Department with the help of the boat builders of West Pakistan, have been completed and engines are being fitted with 30 h.p. engines and are expected to be completed by the end of September 1959 for distribution to fishermen. Another boat building yard has also been established by a private party which has completed the construction of a fishing launch with one of the marine Diesels allotted by the Central Fisheries Department. It has started construction of two more launches for which it has applied for engines. This firm is willing to undertake construction of fishing launches for others also. The Ministry of Food and Agriculture have decided to allot marine Diesels at present lying in Chittagong to private parties willing to take them on the basis of 10 per cent initial payment. More engines will be diverted from Karachi to Chittagong if necessary.

Six private trawlers were expected to start operating off the coast of Karachi by end of 1959. At present Pakistan has only two modern fishing trawlers which are owned by the Central Fisheries Department, Government of Pakistan. During the four months of their operation (December 1958 to March 1959) they caught 225,232 lb. of shrimp and fish valued at Rs. 125,000. Three private trawlers are already under construction and the keels of three more have been laid recently. It is expected that all the six private trawlers will be ready before the next fishing season starts. Side by side, the Central Fisheries Department has been training people to man private trawlers. More than 50 boats fitted with marine Diesels are also expected to be ready by the beginning of the next fishing season. At present 75 such mechanized boats are operating in the Arabian Sea.

Mechanization of the fishing craft has been progressing very satisfactorily. To date 180 gill netters fitted with inboard engines and approximately 40 fully equipped stern trawlers are engaged in fishing. Twenty trawlers and about 15 gill netters are under construction and will be added to the fleet in about three to six months.

In the *Philippines* in 1959, there were 1198 registered mechanized commercial fishing vessels of a total 43,358 GRT and 279 registered non-powered vessels of a total 4,102 GRT. The bancas (dug-out Canoes) and basnigans form the main stay of the fishing industry.

For the most part, *Hong Kong's* shrimp trawlers are sailpowered. The 1955-57 reports of the Director of Agriculture, Fisheries, and Forestry states that only 280 out of the 769 shrimp trawlers based in the colony are motorized. Both types of trawlers use beam trawls with about a 10-foot spread, dragging either 7 or 9 such trawls from booms on either side of the boat and from the mast. There have been no significant changes in the total strength of the shrimp-catching fleet from 1956-1958, although a large number have been mechanized in this period.

An additional 164 vessels joined the mechanized fleet, and after allowing for eighty five former mechanized vessels which either reverted to sail or transferred to the motor trading register, the total strength of the mechanized fishing fleet as at the 31st March, 1959 was 2,366 vessels. Details are shown in Table below:

Hong Kong Mechanized Fishing Vessels and Changes During 1958/59

	Type of Vessel	Total end of March 1958	Changes		Total end of March 1959
			Increase	Decrease	
Trawlers	Company operated British registered (steel) trawlers	9	—	—	9
	Company operated Primitive and Japanese type trawlers	10	2	1	11
	Native type deep sea trawlers	76	5	4	77
	Shrimp trawlers	280	38	15	303
	Native type inshore trawlers	192	28	4	216
Liners	Native type deep sea long liners	66	3	1	68
	Native type inshore long liners	734	40	30	744
	Native type hand liners	55	6	1	60
Seiners	Native type inshore purse seiners	634	25	16	643
	Pa Teng	49	—	2	47
	Ku Peng Teng	12	—	—	12
Misc.	Native type inshore gill netters	82	16	5	93
Collec- tors	Native type fish collectors	88	1	6	83
Total		2,287	164	85	2,366

The mechanization of fishing junks decreased greatly during 1959. The net increase was seventy nine as compared with 763 for the previous year. The reason for this decrease in the rate of mechanization is directly attributable to the unsatisfactory conditions imposed by the Mainland Chinese Government for fishing in their territorial waters.

Seventy nine new power-driven fishing boats after examination by the Fisheries Division were recommended for licensing by the Marine Department. Of these seventy nine vessels, sixty four were built in the Colony (including thirty one at Ap Lei Chau, thirteen at Shau Kei Wan, ten at Aberdeen and seven at Cheung Chau) four at Macau and ten at Chinese Ports.

In local junk building practice the timber is bent into shape by the primitive method of subjecting it to direct fire, while the ends are pressed down with heavy stones. This results in considerable wastage of both material and labour. The Craft Technician designed a simple steam chest which was built and lent to the progressive native yards. This chest was first lent to a shipyard in Cheung Sha Wan in the first quarter, then to a junk builder in Ap Lei Chau in December 1958 and again sent to a native junk builder of Cheung Chau at the end of March 1959. After demonstrations the native shipyards began to adopt this modern method in wood bending.

One Small Long Liner was fitted with a steel rudder and steered by a wooden tiller. Two

modified type shrimp trawlers were fitted with wheelhouses and steel rudders. Each of them had a quadrant at the rudder head connected through chain cable to the steering wheel in the wheelhouse. Six vessels, including three Inshore Trawlers, one Large Long Liner and two modified type Shrimp Trawlers, were constructed with better shaped sterns thereby eliminating the customary 'A' brackets which are normally used to support the long projection of propeller shaft.

In the last quarter of the year fifty two deep sea and inshore wind driven trawling junks were carefully examined by the Craft Technician and the Supervisors. A report was prepared on the condition of these vessels and an estimated cost of conversion to mechanized deep sea trawling junks provided.

Work continued on the design of the proposed new F.D.V. No. 3, the length overall of this vessel being changed from 83 ft. (25.29 m.) to 86 ft. (26.21 m.). The Craft Technician prepared drawings of general arrangement, midship section and preliminary body plan. These plans were submitted to criticism by Marine Department and it was suggested that a turbo charged marine diesel engine should be installed developing 300 B.H.P. at 750 r.p.m. with reduction gear giving a propeller speed of 250 r.p.m. The drawings of general arrangement and midship section have now been redesigned to include this suggestion together with other minor alterations which were considered desirable.

There are altogether about 37,000 fishing craft in the *Republic of Vietnam* of which about 1,700 are fitted with propulsion engines.

In the northern regions of the Republic of Vietnam, the fishing boats are built of bamboo. These bamboo craft have no keels and are flat-bottomed. The boats are constructed by weaving strips of bamboo into the shape of a boat with flat bottom. The craft is made watertight by application of *canarium* resin. The upper portions (above the water level) are strengthened by attaching wooden planks. The craft are light and attain high speed when propelled by sails. Use of bamboo seems to have been prompted by considerations of the lightness and increased speed.

The mechanization of these bamboo craft has presented problems as installation of inboard Diesel is impossible and conventional gasoline operated outboards are costly to run and maintain. The problem has now been solved by the use of outboard propeller shaft and rudder assembly developed by a Japanese Company (Ref: CP 48). These are sold as outboard Diesels in Vietnam but should not be confused with conventional outboard engines. The power of the engine used in Vietnam varies from 3 to 8 h.p. in power and is generally a horizontal single cylinder land engine. The propeller shaft which may or may not be permanently fixed to the stern is driven from the engine shaft by means of a belt-drive. The engine is fixed to the boat by means of a triangular piece of wood which fits flush at the corner of the stern. The engine assembly is slightly heavier than its petrol counterpart of the same h.p. but is cheaper in cost as well as maintenance. Several hundred bamboo-bottomed craft have now been mechanized with outboard propeller shaft assembly.

1.22 Engines

1.221 Types, makes, prices of engines, fuel supply and price of fuel

In *Ceylon*, the following makes of Diesel engines are in current use in private fishing boats:

Armstrong Sidley	— 10-20HP	— air cooled
Bukh	— 10-20HP	— water „
Coventry Victor	— 5-9 HP	— „ „
David Brown	— 12HP	— air „
Deutz	— 9HP	— „ „
Daiya	— 11-27HP	— water „
Kelvin	— 10-20HP	— „ „
Kubota	— 9-18HP	— „ „
Lister	— 12 $\frac{3}{4}$ -30HP	— water & air
North Power	— 16HP	— „ „
Petter	— 10-12HP	— „ „
Perkins	— 28-58HP	— „ „
Ruston	— 12-19HP	— air
Yanmar	— 8-45HP	— water „

Adverting to types of engines for fishing boats in *Japan*, practically all the domestic requirements are met by production in the country. About 50 per cent of them are electric ignition

type; hot bulb engine and diesel engine occupy 26 or 27 per cent, though the former are being gradually superseded by the latter.

*Number of powered fishing boats in Japan
by type of engine, 1956-58*

Year	Steam		Diesel		Hot bulb		Electric ignition		Total
	Number	%	Number	%	Number	%	Number	%	
1956	41	0†	24,274	16	45,539	30	80,096	54	149,450
1957	46	0†	33,705	22	43,202	28	77,607	50	154,560
1958	42	0†	43,621	27	41,812	26	76,615	47	162,090

In *Korea*, the engines used for mechanization are mostly of two types: Yanmar and Daiya (both Japanese) though smaller numbers of Burmeister and Wain, Bukh and Kelvin Diesels are used. Hot bulb engines of up to 120 h.p. are also used. During 1959, 330 diesels were imported while during 1960, 27 engines have been imported so far. The servicing of the engines is mostly done by private workshops. However, the Coast Guard Service also provide servicing facilities for engines of fishing boats. In addition, there are two government workshops which service engines as well as the boats.

In *Malaya*, supply of both petrol and Diesel fuels are available within easy reach of fishing villages although prices of fuels are high as compared elsewhere in the neighbouring countries.

Petrol mixture for outboard engines
M\$2.30 per Imperial gallon

Diesel fuel for inboard engines
M\$0.70 per Imperial gallon

Records of fuel/oil consumption are unfortunately lacking except for three makes of engines. These are accurate records of average prices and consumption, listed according to the H.P. ratings of these of these engines.

Make	H.P.	Diesel fuel	Lubricant	Total running cost per 100 hours
Yanmar	4	\$ 15.00	\$ 1.50	\$ 16.50
	6	25.00	3.00	28.00
	8	30.00	3.00	33.00
	11	40.00	5.00	45.00
	16	60.00	7.00	67.00
	22	100.00	10.00	110.00
	30	115.00	12.00	127.00
M.W.M.	11	32.00	2.00	34.00
	16	39.00	2.40	41.40
	22	50.00	2.50	52.50
	24	78.00	3.00	81.00
	33	80.00	3.50	83.50
	36	117.00	5.00	122.00
	44	140.00	5.50	145.50
Lister	3½			13.00

In *Pakistan*, the types of engines used are marine Diesels, mostly high speed, both air and electric starting.

Makes : Kelvin, H.S.A., Yanmar, Bukh, Ruston, North Power, Gardner, G.M., Lister, Perkins, National Superior Caterpillar, Atlantic, Penta, Phillipino Ricardo.

Prices : Prices of those engines which have been procured distributed by Government Agencies are available and are given below :—

<i>Kelvin :</i>	44 H.P. Rs. 17,000	
	66 H.P. Rs. 23,500	
	88 H.P. Rs. 27,000	
	120 H.P. Rs. 47,000	
	132 H.P. Rs. 42,500	
<i>Ruston :</i>	75 H.P. Rs. 34,500	Prices exclusive of Sales Tax, Custom duty.
	112 H.P. Rs. 40,000	
<i>Yanmar :</i>	55 H.P. Rs. 18,200	
	60 H.P. Rs. 18,300	
	75 H.P. Rs. 25,500	
	90 H.P. Rs. 28,500	
<i>Gardner :</i>	75 H.P. Rs. 24,000	
	114 H.P. Rs. 38,000	
<i>H.S.A. :</i>	50 H.P. Rs. 23,400	Prices inclusive of Sales Tax and Custom duty.
	90 H.P. Rs. 46,100	
<i>North-Power :</i>	40 H.P. Rs. 14,000	
<i>Bukh :</i>	10 H.P. Rs. 5,600	
	20 H.P. Rs. 7,600	
	30 H.P. Rs. 9,000	

Fuel supply : It is adequate. A Diesel pump has been installed at the pier of Fish Harbour, wherefrom fishing boats take their fuel supply. Mobiloil etc. is also available at this pump or with other fuel stations in the city.

Price of Fuel : It varies. The current price of Diesel oil is Rs. 1-2-9 (one Rupee= approx. 21 U.S. cents) per imperial gallon (one imperial gallon= approx. 4.5 litres). Mobiloil is sold at Rs. 10-8-0 per tin of one gallon.

In the *Philippines*, a large number of boats are installed with inboard Diesels while some of the bancas are fitted with outboard gasoline engines. During 1959, 823 craft are reported to be fitted with crude oil and Diesel engines, and 266 craft use petrol engines. More than 80% of the craft are fitted with engines of 50 to 125 h.p. (28%) and over 200 h.p. (55%).

In *Singapore*, the following types of engines are used in fishing craft.

(A) **Outboard Engine** — The more popular ones with easily available spares are :—

(a) **Make of engine and prices**

(1) <i>Seagull</i>	Short Shaft	Long Shaft
(i) 3½ - 4 H.P.	—	M\$585.00
(2) <i>Johnson "Sea Horse"</i>		
(i) 3 H.P.	M\$540.00	570.00
(ii) 5½ H.P.	835.00	870.00
(iii) 10 H.P.	1,155.00	1,195.00
(iv) 18 H.P.	1,360.00	1,400.00
(3) <i>Evinrude</i>		
(i) 3 H.P.	510.00	535.00
(ii) 5½ H.P.	785.00	820.00
(iii) 10 H.P.	1,085.00	1,125.00
(iv) 18 H.P.	1,280.00	1,320.00

Note: Prices quoted above are subject to discount.

(B) **Inboard Engines**—Information on the higher H.P. is not available. Prices of a few low H.P. ones are :—

Make of Engine and Prices

(i) Yanmar	4 H.P.	\$1,500/—
(ii) Petters air-cooled	6 H.P.	2,280/—
water-cooled	6 H.P.	2,600/—
(iii) Bukh	6 H.P.	2,250/—

Note: Prices quoted above are subject to discount.

Fuel supply is ample. Prices ex - pump are :—

(a) Petrol	\$1.91 per gallon
(b) Diesel	0.57 per gallon

Particulars relating to the engines installed in new mechanized vessels in *Hong Kong* are shown in Table below :

Diesel Engines Installed by Fishing Vessels during 1958/59

Trade Mark	Number of Engines			Horse-Power	
	New	Old	Total	Range	Most Popular Rating
(A) British					
'Gardner'	10	57*	67	19-152	60
'Lister'	4	3	7	18-35	18
'Fowler'	—	6	6	10-11	11
'A.E.C.'	—	1	1	77	77
'Ailsa Craig'	—	2	2	20	20
'Petter'	3	3	6	5-20	10
'Kelvin'	—	1	1	88	88
'Ruston'	—	5	5	15-100	22½
'Dormans'	—	2	2	11-12	12
'Parsons'	—	1	1	36	36
Total	17	81	98		
(B) American					
'Cummins'	1	—	1	125	125
'Hercules'	—	4	4	27-160	27
Total	1	4	5		
(C) Swedish					
'Bolinder'	1	2	3	10-32	23
(D) Danish					
'Bukh'	1	1	2	10-20	10
'Calmo'	2	—	2	10	10
Total	3	1	4		
(E) German					
'M.W.M.'	1	1	2	22-44	22
'Guldner'	—	3	3	30-32	32
'Bauscher'	2	1	3	6-8	6
Total	3	5	8		
(F) Belgian					
'La Meuse'	1	1	2	12	12
(G) Japanese					
'Daiya'	10	8	18	5-17	7
'Yanmar'	13	10	23	4-30	4
Others	—	2	2	150-160	150
Total	23	20	43		
Grand Total	49	114	163		

* Most of these were lorry and bus engines converted for marine use. 163 fishing boats were mechanized in 1958/59.

1.222 Servicing facilities

In *Malaya* repair and maintenance facilities are generally good in the larger fishing centres though they are somewhat inadequate in the smaller and more isolated villages. There is no overall shortage of repairmen and mechanics although nearly all of them have had no recognised course of training. Docking facilities for larger boats particularly on the East Coast are almost totally lacking, but as most boats are fairly small, they can be easily hauled out or careened for repair. Spare parts are readily available for the more important engines, but their high prices often surprise the fishermen when such a situation arises. Most operators often attend to minor repairs themselves. Local fishermen depend entirely on foreign makes of engines as none are manufactured in this country.

In *Pakistan*, servicing and repair facilities are available in Karachi and Chittagong. Docking/Slip-way facilities are, however, inadequate. Fishermen haul in their vessels on the beaches for annual check up and hull repairs etc. Essential spare parts are now being imported along with the engines. Minor repairs are attended to by the mechanics employed on the vessels, but major jobs are done in the workshops.

In *Singapore*, a Mobile Unit consisting of a workshop with Foreman Mechanic and a Mechanic/Driver was started in 1953 to provide training facilities to fishermen using outboard engines. The unit was in operation at the fishing villages on 286 occasions in 1959. The total number of engines used as demonstration models was 127. Since 1953 a total of 617 fishermen have been taught how to maintain their engines and to carry out minor repairs.

1.223 Indigenous production of engines

In *India*, at present, groups of fishermen or fishermen cooperative societies are supplied with engines at subsidized rates. The types of engines required vary from region to region according to the design of the boat, the H.P. required for the boat and also the local servicing facilities available. British, Norwegian, Swedish, Danish, Dutch, Belgian and Japanese engines are available and are now being imported for this purpose.

However, with the necessity to restrict the types of engines required for fishing vessels, to at least, 5-6 types and also to encourage manufacturing programmes of marine diesel engines, the Government of India are encouraging such manufacture in the country with foreign collaboration.

In *Pakistan*, Ruston engines (75-112 H.P.) are now being assembled in Karachi by M/s. Karachi Shipyard & Engineering Works.

1.224 Government assistance

In *Ceylon* boats complete with engines and gear are given out on hire purchase by the Department of Fisheries which spends up to Rs. 17,500 on each set of equipment.

Steps are being taken to raise the existing regulation on the registration of fishing craft and to introduce new regulation for the registration of mechanised fishing craft. These regulations are likely to be finalised in the course of 1961.

Applications for the Fisheries Development Loan Fund have been investigated since July, 1960. A revolving fund of HK \$2,000,000, established by the Government of *Hong Kong* is to provide the larger loans up to \$150,000 per applicant required to build, mechanize, equip, and maintain mid-and distant water fishing vessels.

In *India*, the Government has sanctioned a subsidy of 50% on engines. Half of the costs of engines is also given in the form of loan. Mechanized boats are also constructed by the Fisheries Department and issued to the fishermen at subsidized prices. The engines are also now supplied to fishermen at subsidized rates. Facilities are also extended for import of engines at present as also for spare-parts. The firms, which would undertake manufacture of marine diesel engines in the country would be encouraged in the usual manner.

In *Korea*, for acquisition of engines, 80% of the cost of the engine is given as loan to fishermen repayable in 5 years. Formerly an interest of 8% was charged but now the loans are interest-free.

It is the intention of the *Malayan* Government to provide such facilities as may be required by fishermen to repair and maintain boats, since in some circumstances repairs involve large sums of money, normally beyond the saving of the ordinary fishermen. Recommendations have been put forward to the Ministry of Agriculture to extend loans not only for purchase of fishing boats and gears but for their major repairs as well.

In *Pakistan*, certain fishing requisites such as marine Diesels, navigation instruments, etc., are exempt from duty imported through the Karachi Fisherman's Cooperative Purchase and Sale Society or through the Director of Fisheries, East Pakistan.

Apart from the Government Sector fisheries programs, the Government of Pakistan has recently sanctioned a program for fisheries development under private sector for implementation within the course of a year at the total cost of about Rs. 12 million (Rs. 3 million internal and Rs. 9 million in foreign exchange). This program includes (in addition to fish processing and handling equipment) 2 carrier vessels, 8 mechanized fishing boats and 1 shrimp trawler for Karachi; 1 carrier vessel, 4 mechanized fishing boats and 1 shrimp trawler for the Mekran Coast; 4 fishing launches and boats, 2 carrier vessels, 2 shrimp trawlers. Government will give reasonable assistance to private parties who may wish to take advantage of and participate in this program. Cooperative Societies will be given preferential treatment.

In *Hong Kong*, some government assistance is afforded owners of shrimp vessels in the form of low-interest loans. These loans are made only for the purchase and repair of craft and gear. They are made to the individual vessels either through cooperatives or direct by the Department of Cooperatives and Marketing or the Department of Agriculture. No financial assistance in any form is given to commercial processors or exporters by the government. There is no foreign participation in the Hong Kong shrimp fishery or processing industry.

1.23 Effects of Mechanization

1.231 Extension of Fishing Grounds

In *Ceylon*, there has been no great extension of the fishing grounds yet, but the mechanized boats can certainly exploit an area of the sea that was not usually within the reach of the old native craft.

In *India*, mechanised boats go out to a distance of about 50 miles from the shore as against a distance of 20 miles by a non-mechanised boat of Bombay Coast; the mechanised boat normally goes about 10-15 miles beyond the existing range of the local boats in other parts.

In *Pakistan*, there has been a definite extension in the range of operation of the fishing craft as a result of the mechanization in Pakistan. These crafts fish on grounds located as far as 250 to 300 miles from Karachi and nearby fishing centres as against the sailing craft which hardly fished 60 to 70 miles away. These craft fish all along the West Pakistan coast, upto the Iranian border in North-West and the Indian border in South-east. However, there has not been any marked thrust in the offshore waters, perhaps due to the fact that, so far, grounds have not been located in waters deeper than 20 fathoms (36.57 m.).

1.232 Fish Catch

In *India*, in addition to the extension of fishing grounds, the mechanised boats operate for a longer period for fishing and the fishing capacity has increased by 2-3 times. The fishermen's earnings also have increased 2-3 fold. More details are given in the chapter on "Requirements of Mechanised Fishing Program" of the report of the Fisheries Enquiry Committee.

Fish catch in *Pakistan* considerably increased as a result of mechanization as would appear below :

Year	Production in tons
1957	83,000
1958	84,000
1959	94,000

12.33 Fisherman's Earnings

In *Ceylon*, the proceeds of the sale of each day's catch on a mechanised boat is generally divided into seven parts after dividing the days expenses. One part goes to each of the five members of the crew and the balance two parts to the boat owner, who would thus get three parts if he is also a member of the crew. Most mechanised boat owners and operators are very much better off than they were with their old native craft and methods.

In *Pakistan*, there has also been a sharp rise in the fishermen earnings in Pakistan. A fishermen who, two-three years ago, hardly used to earn Rs. 60-70 a month now easily makes Rs. 120-150 a month. Captains and mates employed on trawlers are paid a monthly salary of Rs. 300-400 per month, plus a percentage of the catch. Besides this, the crew get free food during the period they are out fishing.

1.234 Employment (reduction in the number of crew on a boat)

In *Pakistan*, there has not been any reduction in the number of crew due to the fact that fishing from these craft (gill netters) is still done manually. These crafts are mechanized for propulsion purposes only and do not as yet employ mechanized devices for handling gear. Shrimp trawlers, which are fitted with winches, davits, derricks etc. carry a crew of seven to nine.

In *Hong Kong*, the Government Fisheries Division Vessel No. 2 "YUEN LING", a 34 feet experimental boat is fitting the mechanical device to handle gear for stern trawling. It is recommended by the Fishing Master of Cooperative Development and Fisheries Department. By fitting the additional warping drum on the back axle winch, the total number of crew employed can be reduced from six to four in this size of vessel.

1.3 Training for Boat-builders

1.31 Appoinment of Craft Technicians in Government Fisheries Departments

The Government of *India* organised three courses for training Fisheries Officers from the

State Governments in fishing boat designs and construction. The number of candidates trained in each course is as follows:

- (1) 1957 — 6 months course — 10
- (2) 1958 — 6 months course — 10
- (3) 1959 — 3 months advanced — 10
course

These candidates are now employed in charge of boat building in the States of Gujerat, Mysore, Kerala, Madras, Andhra Pradesh, Orissa and West Bengal. Two candidates from Madras and Mysore are now being given two months advanced course in fishing boat designs.

In *Pakistan*, except for the Fisheries and Gear Technologist, employed by the Central Fisheries Department at Karachi there is no other craft Technician.

In *Hong Kong*, three qualified officers (one craft Technician concerning engines, one Draughtsman, and one Master shipwright) for Boat Building Section were employed in the Fisheries Division of Cooperative Development and Fisheries Department during the Session. They are doing their best to help the local fishermen and improve the local fishing boat building.

1.32 Training of Boat-builders in Modern Carpentry Work

In *Ceylon*, there is an FAO expert boat builder with a Ceylonese undertaking which is responsible for supervision of the work of the boat yards and for training of the technicians in the yards. Since the arrival of this expert about a year ago, the standard of construction of boats has improved to a very marked design.

In *India*, in view of the necessity to train carpenters in understanding the designs and also follow up the lines of construction, the Central Fisheries Technological Research Station, Cochin, is now providing a course for 7 candidates (carpenters) deputed by the State Fisheries Department. This course is to last for a period of 9 months.

The Rural and Industrial Development Authority of the Federation of Malaya is providing training facilities at its dockyard in Kuala Trengganu for East Coast fishermen.

In *Pakistan*, training facilities for boat-builders in modern carpentry work are not available; perhaps the boat-builders do not require such coaching. They are well versed in the art of boat-building and make excellent boats. Their workmanship has been acknowledged by FAO and other naval architects.

The newly-appointed Master Shipwright in *Hong Kong* is training 22 students for "LAYING OFF" vessels. The object of the training course is to teach the local junkbuilders how to read drawings and build their vessels according to the lines and plans of the vessels designed by Naval Architects. The course is to be completed in 3 months of evening classes. The idea of teaching in the evening is to please the junkbuilders who are working in the days to earn their living.

1.4 Fishing Ports

In *Ceylon*, a team of Japanese harbor engineers who visited Ceylon in February 1960 at the request of the Government of Ceylon, has completed its report on the potential development of a network of small fishing ports in that country. It is understood that about fifteen locations were recommended as feasible for development as fishing ports. Much emphasis was laid on the development of the fishery industry in the Ten Year Plan which incorporated the recommendations of another Japanese team's report made in 1958. Construction of ports and shelters are a primary concomitant to the introduction of the large number of mechanized fishing craft recommended in the plan.

In *Korea*, there are about 60 fishing ports, large or small, along the coast of south Korea which provide fair to good facilities for the fishing fleet. Many of these ports have good mooring and docking facilities and have been improved with breakwaters, sea walls, wharves, and most of the facilities needed for loading and unloading. Very little maintenance and repair work and been done for a number of years, and most of the ports were badly run down especially during the Korean war. But, with the Government Subsidies and the economic assistance funds by

FAO and ICA, most of the major fishing ports have been rehabilitated.

In *Malaya*, in the proposals of the Fisheries Department for the 1956-1960, Development Estimates Schemes for development of fishing ports and provision of landing jetties were put up costing a total of M\$317,000/—. Of this sum M\$60,000 was approved for 1959, and M\$140,000 was approved for 1960, making a total of M\$200,000/—. A balance of M\$117,000/— is required for the completion of this item of development. The recent developments in the use of diesel engines in fishing craft and, perhaps more important, recent restriction imposed on fishing operations in or near Indonesian waters have caused many West Coast fishermen particularly those from Malacca, to seek new fishing grounds in the North and Northwest of the Malacca Straits. It is essential that a convenient base should be provided for them in the North West and it is proposed to develop Pulau Langkawi into such a base. For this purpose it is proposed, in the first phase to provide longhouses for the fishermen, a fuel store and an ice store for which M\$40,000/— are required,

i.e. Two longhouses	M\$25,000
Ice Store	10,000
Fuel Store	5,000

Phase II in 1961 would be provision of another two longhouses costing M\$25,000/—.

A similar scheme is proposed for Pulau Tioman, Pahang, to serve the fishermen of Pahang and Johore who fish from the island during the North East Monsoon. The first phase for Tioman would be construction of two longhouses costing M\$25,000 in all and Phase II in 1961 would include provision of an ice store, fuel store and two longhouses at a total cost of M\$40,000/—.

The revised estimated cost of this item in the Development Estimates has been increased to M\$317,000/— by addition of the following items:

(1) Jetty at Kuala Pahang,	
Pahang	M\$7,500
(2) Jetty at Nenasi, Pahang	7,500
(3) Jetty at Kuala Rompin, Pahang	7,500

- | | |
|--|--------|
| (4) Fishermen's Rest House, Telok Kumbar, Penang | 4,500 |
| (5) Jetty at Tumpat, Kelantan | 20,000 |
| (6) Jetty at Dungun, Trengganu | 20,000 |
| (7) Jetty at Kemaman, Trengganu | 20,000 |
| (8) Two jetties in Trengganu | 40,000 |

These fishing centres in (1), (2) & (3) are located on the undeveloped coast of Pahang where there is urgent need to provide better communications and facilities for the coastal peoples. The fishing communities work under extremely adverse conditions and it is a matter of urgency that they should be provided with the facilities to improve these conditions.

The Rest House proposed for the Telok Kumbar, Penang is required as a halting bungalow for Telok Kumbar fisherman. The fishing village is a long way from the place where the fishing boats lie and, in order to catch the tides, the fishermen are often forced to sleep on the beach at night. The provision of a simple building to shelter them from the weather and to provide covered sleeping accommodation will be of great benefit to the community.

The jetties in Kelantan and Trengganu are required in important fishing centres where landing facilities are inadequate or non-existent. The rapid progress of mechanization of fishing craft and the increase in size of these craft have rendered the traditional beach-landing of fish difficult or impossible and improved facilities are essential.

For 1961 expenditure envisaged is:

Development of Pulau Langkawi	M\$25,000
Development of Pulau Tioman	40,000
Two jetties in Trengganu and Kelantan	40,000
One jetty in Pahang	7,500
Fishermen's Rest House, Penang	4,500
	<u>M\$117,000</u>

A sum of M\$16,000 was approved for providing lights, buoys, and navigation aids for fishing villages in the 1960 Development Estimates to provide for river estuaries for the West Coast.

A similar amount is also proposed for the provision of the same facilities for the East Coast. It is estimated that a total of M\$10,000 per annum will be required to maintain and service all the lights which are being supplied. This includes replacement of gas cylinders, replacement of damaged or worn out parts and also payment to villagers who would be hired to operate and maintain the non-automatic oil lamps.

2. GEAR

2.1 Mechanized Handling of Gear

2.11 Use of line haulers, capstans, winches, etc.

In *India*, the use of winches, gurdies and line-haulers is becoming very popular with the fishermen in view of the benefits for operating larger number of units of gear. The possibility of manufacturing these items of equipment locally is also being examined.

In *Japan*, in the phase of mechanized handling of gear, appreciable progress has been made by the use of line or net haulers and fish finders. Direction finders such as radar and loran are increasingly accepted by fishermen one season after another.

In *Korea*, the single-boat type purse seiners have been mechanized by installation of boom-tip powerblock-type net hauler. Trials have shown that this is more efficient than 2-boat purse seiners and existing boats are being converted to single boat seiners by installing the power block. Since 1957, the catch of *Trachurus* increased from 12,000 tons to 50,000 tons by modernization of the purse-seining techniques.

In *Pakistan*, except for the shrimp trawlers, which are fitted with trawl winches, no other type of fishing craft employ any type of device for mechanized handling of the gear. There is, however, a growing realization amongst the fishermen that it would be to their advantage to employ capstans, gurdies, etc. for handling gill nets. It is, therefore, safe to presume that in a year or two these aids will be installed on these craft.

- 2.12 Effect on employment (due to reduction in crew on a mechanized boat) No information available.

2.2 Improved Types of Gear

2.21 Attraction of fish (by light, etc.)

In *India*, the trials relating to light fishing are being conducted at the Central Fisheries Technological Research Station, Cochin.

In *Korea*, light has been used to attract mackerel and squid. Underwater lighting equipment consisting 5 electric bulbs of 200 W each, disposed in five directions, has been very successful in increasing the catches of squid.

In *Malaya*, the stick held dip net using light as a means of attracting fish was attempted around most of the islands on the East and West Coasts. There was some measure of success in this in that it attracted fish and the possible conclusions are:

Fish especially bilis (Anchovy), paku (*Atherinidae*) and sotong (Squid) are attracted to light.

Fishing with light is best done only on dark nights.

The current around the area to be fished should not be too strong, as easy lifting of the net plays a part in landing of fish.

Rain probably plays a part in bringing about a shoal.

The colour of the net should probably be green as a brown net frightens fish when hauling.

Off an Island, the light nearer to it attracts the shoal first.

When the light is put off the shoal immediately disappears.

Large tamban play around the edges of the light.

Fish that are attracted are bilis, paku, tamban (*Clupea* sp.), todak (*Belonidae*), pelata (*Scomber microlepidotus*) and the sotong (Squid). Best results were shown at Pulau Paya on the West Coast, and Pulau Tioman on the East.

In the North West lamp-fishing by pukat jerut (Purse Seine) fishermen is an interesting development. Makeshift lamps are submerged to a fathom or so over an old fishing stake site and allowed to drift with the current. The lights would act as lures and a net is shot round the lamp. A somewhat similar technique is employed by pukat tangkol fishermen who use gasoline lamps hanging from the fifth boat or especially made rafts to attract the fish. Technical details about lamp-fishing are under study by a Japanese Fishing Expert under the Colombo Plan. Preparations are under way to hold a demonstration to Kuala Kedah fishermen during which the expert experiments with more powerful lamps (three 500 watt bulbs and six 36 watt bulbs). In Trengganu this type of fishing was carried out at night without the use of unjangs (an anchored clump of coconut leaves market by a float, which attracts fish) and has been very successful.

2.22 Improved traditional and new types of gear

In *India*, the offshore Fishing Stations of the Government of India have been conducting experimental fishing with trawls, gill-nets and lines. Studies of different types of trawls for different types of fish and various kinds of otter-boards, are being undertaken.

In *Korea*, M.S. CHINAM-HO of a Korean firm made her maiden voyage to the Indian Ocean in June, 1957 to participate in the demonstration fishing operation project under ICA aid program of Fiscal Year 1957. Fifteen days of fishing operations of the fishing vessel on the ocean resulted in catching approximately 50 metric tons of various species of tuna. The vessel left again on January 21, 1958 for her second fishing voyage for tuna fishing grounds off the Samoa Islands of the U.S. Territory. The firm has made a contract with a U.S. cannery firm as to the fishing operation of the vessel and sale of its catch. In addition to M.S. CHINAM-HO, M.S. HAERYUN-HO left for the Samoa Islands for tuna catching. They are still operating in the area for tuna.

In the past, shrimp were caught by several different kinds of gear, including small gill net, seine nets, ankangmang (anchor trap nets) and

some flow set nets during the migration of shrimp to in-shore areas to spawn. Shrimp was also caught by the motor trawlers during the operations for other types of fish. The annual catch of marketable size amounted to about 2,000 tons. However with the small scale fishing methods, the fishing grounds are limited to the area on or near the spawning grounds. These small scale operations were not economically sound and were not good conservation methods.

In order to protect the shrimp resources, the deep water beds offshore must be found. The Gulf of Mexico Design shrimp trawl net has been introduced which has already been adopted by thousands of shrimp boats in the U.S.A. The Central Fisheries Experiment Station has conducted demonstration explorations for shrimp on the east, south and southwest coasts. This project has already shown results in that beds of shrimp which can be commercially profitable have been discovered on the east coast and near the southern islands.

In *Malaya*, experimental fishing surveys were held in the period 1959/1960 to locate tuna fishing grounds from Lat. 2°N to 6°N. along the east coast of Malaya, and from 6°N. to 7°N. off the north west coast, at depths ranging from 24 to 40 fathoms. Tuna fishing was also carried along the 100 fathom line off the coast of Thailand. From results obtained, no tuna fishing grounds were discovered; however the east coast does show promise as a fishing ground for Marlin.

In the tuna long line the difficulties met with were rough weather, and bamboo floats of bubu traps. The latter prevented the drift of these lines, and when this happened, the results were invariably nil.

In the bottom long line the area traversed was off Kelantan, Trengganu and Pahang. Between Kuala Trengganu in Trengganu and Bachok in Kelantan lie a cluster of islands which cover an area of about 1,800 sq. miles with a depth range of 20 to 40 fathoms. Between 6° to 40' 00" N. Lat. and 99° to 100° E. Long. lie the large islands of the Butang group, Terutao and Pulau Lankawi with depths ranging from 11 fathoms to 33 fathoms. All around these

areas the bottom long line was attempted. From results obtained it was found that whenever the ground was of fine sand, soft mud and black sand, the fish caught were of poor commercial quality (frogfish, etc.). On the other hand when the ground consisted of shale, shell, gravel, coral and reeds, the fish caught were of an improved quality (grouper, snapper, etc.) but the snag lay in the fact that the lines, due to the nature of the ground and current often became entangled. The catch on these lines cannot be said to be very promising. On one survey, the catch rate of fish stood at 3 per hour. This includes the prolific Yu and Duri. The same result can be said to have been obtained from other areas fishes. In shrimp trawling, the beam trawl was towed mechanically at 1-1½ knots, results of catch were not promising. Apart from shoals of small fish, the amount of shrimps caught was only a handful at each tow. The tows were usually made at depths of 4 to 5 fathoms over mud beds.

The numerous fishing stakes which are operated in Malayan waters constitute a continuous source of trouble to net fishermen and a danger to navigation along the coasts. There are a number of different types of Japanese fishing nets which operate in a manner similar to the Malayan fishing stakes but which use netting instead of wooden stakes in their leads and enclosures. These set nets are efficient, removable and, unlike fishing stakes, can be taken out of the water at the end of a fishing season and kept for the next season. There are no experienced set-net operators in Malaya and it is proposed that a Japanese expert should be obtained under Colombo Plan programme to carry out a survey of the possibilities of introducing these nets to Malaya and to carry out experiments to determine the most efficient structures and method of operation for local conditions. He would also be required to train local fishermen in operation of the set nets. The Donor country would meet the expert's travelling expenses to and from Malaya and his salary. His local allowances etc. would be met by the Malaya Government. His services would be required for two years.

The principal fishing methods of fishing in *Netherlands New Guinea* are hand-lining and

long-lining. Nets, which play an important part elsewhere, are only used on a very limited scale in this region. Apart from the natural circumstances, which are often an impeding factor, the native vessels are not suitable for fishing by means of nets. The limited fishing methods and the consequent seasonal character of the industry check the progress of the indigenous fisheries.

In *Pakistan*, the traditional gill net has been considerably improved. Synthetic floats and lead sinkers are now respectively used in place of drift wood and stones. Cotton has given way to nylon and the length and depth of the nets have increased many fold. A 45 ft. (13.71 m.) gill netter, on an average, employs approximately a mile and quarter long net and about 9-10 fathoms (16.45 to 18.29 m.) deep.

Shrimp trawl net is the only exotic gear adopted by our fishermen. They make it locally, preferably of nylon. An average trawl net has the following dimensions:

Length:	65 ft.-75 ft. (19.81 to 22.86 m.)
Mouth opening:	40 ft.-50 ft. (12.19 to 15.24 m.)
Mesh:	2 in. body (5.1 cm.) 1½ in. cod end. (3.8 cm.)

In *Vietnam*, otter trawling has been introduced in the south with some success. Japanese-type otoshi-ami has also been successful but due to the heavy capital investment involved, its use has not spread. The Japanese stick-held dip net is also reported to be successfully tried.

2.32 Detection of fish (use of echo sounders, etc.)

In *Japan*, fish finders are used not only for detecting fish but also in midwater trawls and other gears to find out whether fish are entering or escaping from the bag and also the distance between the otter boards. Generally echo sounders with different operating frequencies are favored such as 40 or 70 Kc. and 200 Kc. Since last year, fully transistorized echo sounders which operated on torch dry batteries for 3 months, have been produced in Japan. These sounders, approx. 275 mm. broad and 175 mm. high including the

paper recorder cost, approx. ¥120,000 (US\$280). Particularly, the popularity of fish finders is rapidly expanding among boats of less than 5 tons, most of larger boats being already equipped. The number of fish finders now in service for Japanese fishermen is estimated to be more than 15,000 sets.

In *Pakistan*, echo sounders are not used at all. Older methods of detecting fish by means of visible signs are still practised. There is, however, a growing realization especially amongst the trawler fishermen that the use of echo sounders will greatly increase their catches. Arrangements have accordingly been made to import dry paper type echo sounders from abroad.

2.24 Use of new materials

2.241 Synthetic fibers, floats, etc.

In *Ceylon*, complaints have been received that nylon gillnets cause decomposition of the fish caught in them. From inquiries in the Negombo area, it has been found that fish caught in nylon nets decompose because of the long intervals that elapse between collections of fish from these nets. Nylon nets do not have to be dried regularly and are left in the sea for several days. Fish caught in the nets are removed from the nets at the fishermen's convenience. The quality of the fish caught in nylon nets has been good when the fish is collected after 6 hours. It has been found that overnight catches (i.e. where collection is made only after 12 hours) contain a high proportion of decomposed fish. From investigations made by the Department it appears that the decomposition of fish caught in gillnets depends on the type of fish and length of time that the catch remains in the water after death and not on the material of the net. Nylon net fishermen are advised to collect their catches at short intervals of time, say with 6 hours.

The Ceylon Cooperative Fish Sales Union has imported a stock of nylon fishing nets, twine and Kuralon rope from Japan for sale to fishermen. Fishermen's Cooperative Societies and recognized Fishermen's Study Circles will be given a discount of 5% on the prices given below. The Union will also sell to individual fishermen who bring a certificate from the Fisheries Inspector the of

area certifying that the intended purchaser is actually engaged in fishing and that this gear is necessary for his fishing operations. The certificate should also state the quantity of each article required. The prices of the materials are given below.

1. *Nylon fishing nets*—6 in. stretched mesh, natural white, 50 meshes deep, 500 meshes long, double selvaged 120D/30/Z3 double English knot 16.55 lb. per piece. Rs. 185.00
2. *Nylon fishing nets*—6 in. stretched mesh, natural white, 50 meshes deep, 500 meshes long, double selvaged 210D/27/Z3 double English knot about 14.82 lb. per piece. Rs. 170.00
3. *Nylon Twine*—210D/30/Z3 natural white Rs. 9.85 per lb.
4. *Nylon Twine*—210D/27/Z3 natural white Rs. 9.25 per lb.
5. *Kuralon Rope*—6 mm. diameter 205/50 × 3 × 3 one coil about 117.6 fathoms. Rs. 101.00 per coil
6. *Nylon Twine for selva*—210D/60/Z3 natural white. Rs. 8.50 per lb.

During 1959, the use of nylon nets for fishing has increased considerably. Cotton nets are being gradually replaced by nylon nets. Nylon nets are mainly used by the *teppam* and *kattumaram* (log raft) fishermen. The largest number of nylon nets are used in the Negombo, Manner and Kankesanturai areas. It is estimated that about ten thousand nylon nets are now in use.

Catches in the nylon nets especially of mesh size 5"-5½" and 6" have been extremely good in centres between Chilaw and Beruwala with the result that the demand for nylon nets has increased. More mechanized boats have also taken to net fishing especially in Negombo and Mutwal.

A special discount will be given to Co-operative Organizations and members of Fishermen's Co-operative Societies on production of evidence of membership.

In *India*, synthetic fiber and improved types of floats are being utilised for gill-nets and drift-nets. Further experiments are in progress.

In *Japan*, a number of different types of synthetic fibers are being used not only for different fishing gears but also for different parts of a net. The most commonly used materials appear to be Kuralon (Polyvinyl alcohol), Saran (Polyvinylidene chloride), nylon and polyethylene. About 30% of the fishermen still use natural fibers. For set nets (e.g. Otoshiami), Kuralon is exclusively used though the bottom portions may be made of Saran (density about 1.4) and upper portions of polyethylene (density about 0.9). Purse seines are generally made of nylon (density 1.19) with Saran for the bottom portions. Consumption of fishing nets and ropes has been also on the increase in both kinds of material: natural fiber and synthetic one. In 1958 the amount of yarns and filaments used for fishing gear totaled approximately 50,000 metric tons, of which about one-fifth was synthetic fiber.

*Production of fishing nets and ropes in Japan, 1956-58**

(Unit: 1,000 pounds)

Year	Fishing net			Fishing ropes			Total
	Natural fiber	Synthetic fiber	Subtotal	Natural fiber	Synthetic fiber	Subtotal	
1956	11,544	11,890	23,434	17,015	3,790	20,805	44,239
1957	8,266	14,247	22,513	15,123	6,253	21,376	43,889
1958	3,467	7,391	10,858	6,031	3,117	9,088	19,946

* Includes the first six months only.

It is expected, however, that a major portion of the natural fibers—particularly hemp and sisal—will be replaced by synthetic fiber in the near future when cost of the latter is cut down by production on a greater scale than the way adopted at the present time.

In *Korea*, in the gillnet fishing industry prior to 1952, cotton net materials were mostly used but in December 1952, with the importation of nylon gillnet for Spanish mackerel by a certain fishing company in Pusan, Korea, all the gillnet fishermen have replaced their cotton gear with nylon material. The situation regarding the purse seine is the same (about 50% is replaced by synthetic fibers), except that Kuralon is used. For set nets, 90% of these are of synthetic fibers with Saran. Nylon is used for trawls also. There is also a modern steel wire rope factory at Masan which produces 2,000 tons of wire rope annually which is more than twice the annual demand from the fishing industry. In addition, there are some 13 textile rope factories in Korea.

In *Kuala Trengganu, Malaya*, a synthetic drift net fisherman designed out of his drift net a special net called pukat rapang for catching rapang (mullet). An additional line of floats is attached to the middle of the net and bamboo bars are inserted at 4 fathom intervals to open up the net centre. Weights are tied to the foot rope of the lower section of the net which acts as the wall. The net is drawn towards the shore and the fish on being confronted with the net will jump over and land in the trough formed by the two lines of floats. A new pukat jerut bilis (anchovy purse seine), 360 yards long and 34 yards deep made entirely of synthetic fibre Saran N was introduced at Kuala Ibai in June. The net costing M\$ 6,500 has proved fairly successful, and orders have been placed for eight more of them.

No major changes in gear were recorded during the 1958-59 period as the traditional ones are still proving efficient. The drift netters, however, have shown a complete change over from ramie and cotton nets to synthetic fibres. The more popular synthetic fibers being Saran Nylon-twine No. 9, of 3" mesh size for catching large prawns. Catches of prawns with nylon nets

have since doubled besides permitting day and night fishing in deeper water.

Fishermen have also recorded improved catches of the *Rastrelliger* species using Taviron nylon netting for purse seines. The disadvantages of the synthetic fibers are their high cost, difficulty in mending and greater damage by sharks, which altogether seem to offset greater use of these nets. These set-backs have not in any way discouraged the fishermen from switching over to synthetic fibres, and their enthusiasm has been shown by the number of orders they have placed for synthetic nets in recent months. Mechanisation of gear has not been successfully introduced into the fishery.

In *Pakistan*, nylon has, more or less, completely replaced cotton in the making of gill nets. Fishermen prefer Z twist nylon and the following sizes are imported, mostly from Japan and Canada: 210/Z/12; 210/Z/36; 210/Z/39; 210/Z/45; 210/Z/51. Approximately 533,000 lbs. of this nylon has so far been distributed to the fishermen and orders for another 380,000 lbs. have been placed. This nylon is being sold to the fishermen at the rate of Rs. 9/—/— per lb.

More than 140,000 synthetic floats of the following sizes have also been imported and order for another 12,000 has been placed:

- a) $3\frac{1}{2}" \times 3" \times \frac{3}{4}"$ — 15,000 pieces
- b) $3" \times 3" \times \frac{1}{2}"$ — 15,000 „
- c) $6" \times 4\frac{1}{2}" \times \frac{7}{8}"$ — 110,000 „

The large sized floats are now being imported and sold to the fishermen at the rate of Rs. 1/12/— per piece.

In *Singapore*, in the latter part of 1957, drift-netters in Singapore started to use synthetic fiber nets on an experimental scale. The results were very satisfactory and the process of changing over from ramie nets to the new nets was very rapid. The drift-netters are now using synthetic fiber nets. The net in use is the type for Spanish mackerel (*Scomberomorus* spp.) and Dorab (*Chirocentrus dorab*) and its specifications are:

3 in. (76 mm.) stretched mesh, 610 meshes long, 140 meshes deep with a bottom selvage of Saran which is of the same mesh size and 10 meshes deep to serve as a sinker.

In *Vietnam*, nylon is making headway but cost is an inhibiting factor. There are no restrictions on imports but customs duty of about 30% has to be paid. During the last two years nylon and other synthetic fiber netting have been demonstrated to the fishermen who are now aware of the advantages of these new materials.

2.242 Government assistance in procuring synthetic fibers

Nylon twine and ropes etc. imported for the exclusive use of fishing industry and exempted from the payment of Custom duty and Sales tax in *Pakistan*.

2.3 Supply of Fishing Gear

2.31 Indigenous production by traditional methods

In *Pakistan*, prior to the adoption of nylon, gill nets were made of cotton, a fiber extensively grown in the country. Fishermen used to buy cotton twine from the local textile factories for making their nets. Now, however, nylon twine is imported and is woven by the fishermen into their nets. Ready made nets are not imported.

2.32 Import Policy

In *Ceylon*, the Corporation Fish Sales Union has entered the import trade for synthetic nets and lines in competition with the private trade and as it is selling at very little profit, has been able to sell at considerably lower prices and to capture most of the local market.

The *Government of India* have set apart some funds for the import of fishing equipment like synthetic twine, hemp twine, engines, hooks, etc.

Pakistan Government gives licences twice a year, either from the aid funds or from her cash resources for the import of fishing requisites including fishing gear. These licences are issued in the name of Karachi Fishermen's Co-operative

Society who invites world wide tenders for finally deciding upon the best make in consultation with the fishermen.

2.33 Fishing Gear Factories

In *Japan*, there are a large number of factories which produce fishing nets, wire ropes, floats, etc., using indigenous machinery. The production capacity is sufficient to satisfy internal demand and leave surplus for export. Generally, completely assembled nets are sold to the fishermen or exported. A typical factory for making webbings of cotton or synthetic fibers has a monthly capacity of about 30,000 lbs. (at 70% capacity) with 50 sets of netting machines (English knot), 5 sets of netting machines (Reef knot), ring twisting machine (5,000 spindles), stretch-twisting machine (10 sets), two to three sets of heat-setting machines and dyeing equipment. Generally brown or blue dyes are used. The factory employs 250 workers of which 200 are female labor. If new factories are to be installed, a minimum economic unit is considered to be: 10 sets of net knitting machines, ring twisting machine (500 spindles), one heat setting machine and dyeing equipment. Ten technicians (4 men and 6 girls) are necessary to train the workers for a period of six months. The cost of this economic unit in *Japan* is stated to be: net-knitting machines, 1 million yen per machine (2,800 US\$); ring twisting machine, 8,000 yen per spindle (22 US\$); heat setting machine, 1½ million yen per machine (4,200 US\$); dyeing machine, one million yen (2,800 US\$).

In *Korea*, 31 factories (capacity 1,075 tons/year) exist for making fishing nets and twines, with one wire rope factory (capacity 2,500 tons/year) and 13 other natural fiber rope factories (capacity 4,000 tons/year). One of the bigger net factories has a capacity of 400,000 lbs. of webbing/year and is equipped with 5,600 spindles, 14 net weaving machines, and employs 120 workers. The capital investment is around US\$ 50,000. All nets are of single knot type and are fixed by dry heat. Only webbing is sold to the fisherman but no completely assembled nets.

In *Pakistan*, fishing gear factories, in the real sense, do not exist. There is a group of

fishermen specialized in net making to whom other fishermen take their twine for making nets according to their specifications. No machine is used in making these nets. The Provincial Fisheries Directorate of East Pakistan have, however, imported a net making machine for making webbing only.

In Saigon, *Vietnam*, there are three fish net manufacturing factories, all using Japanese machinery. Two of these are about the same as the "economic unit" i.e. they consist of about 10 sets net knitting machines, with 500 spindles each. These two factories manufacture exclusively cotton webbing. The third plant which is much bigger than the other two is designed for producing nylon webbing and is equipped with heat setting machines etc. This factory is not yet completely erected. Other modern fishing requisites, such as plastic floats, etc. are imported. At present, it is stated that these three net factories satisfy only about 20% of the requirements of mechanically made webbing. Only webbing is supplied to the fishermen who assemble their nets, though the factories may supply completely fitted trammel nets.

2.4 Preservation of Fishing Gear

In *Malaya*, traditional hot and cold cutting treatments of cotton and ramie nets are the ones in use. Nets are usually preserved with mangrove bark imported from Thailand as well as from indigenous barks.

Chemical preservatives have not been used successfully in spite of their availability as cutting practised by our fishermen leaves the net softer.

Most fishermen preserve their own nets while in some cases (the Chinese in particular) communal facilities are provided, by means of open fires, bamboo platforms and tanks.

In *Pakistan*, coaltar and 'Goran', an indigenous bark found in East Pakistan, are used for net preservation. Coal-tar, which is produced locally in some quantities, is supplemented by restricted imports. In West Pakistan 'Kutch' is imported from Malaya etc. for tanning of cotton gill nets and trawl nets.

The traditional fishing gear in *Vietnam* is mainly made of cotton though ramie fiber is used for finer gillnets. The nets are generally preserved in mangrove bark extract and vary in color from dark brown to almost black.

2.5 Weather Forecasting

In *Malaya*, daily forecasts over Radio Malaya of weather conditions covering the North-East Monsoon months on the East Coast i.e. from November to February, were instituted in 1958-1959 and they have since proved to be of great benefit to fishermen on the East Coast. Many of the fishermen were enabled to fish in the fine days of the monsoon period, as a result of these broadcasts which give the speed of wind and the height of the swell anticipated.

In *Pakistan*, twice a day Radio Pakistan broadcasts weather forecast. Besides this, port authorities also indicate impending storms and disturbances in the sea by hoisting flags in the port.

2.6 Fishermen's Training

In *Ceylon*, training classes for fishermen were held during 1959/60. The courses were conducted by an FAO Marine Engineer assisted by Departmental officers. The majority of the courses were held in the fishing villages, while a few were held in Colombo at the Fisheries Factory, Mutwal. About 500 fishermen attended the courses. Instruction was given six hours daily and in most cases the duration of the course was two weeks. The training given covered the operation, servicing and maintenance of small Marine Diesels. In three courses of one week's duration outboard motor operation and servicing was treated.

The Department of Fisheries has acquired a considerable amount of training material by purchase or as gifts from engine agents and now has engines of 8 different makes, including two sectionalized engines for use in fishermen's training.

A number of fishermen were given training in the rigging and use of nylon bottom set gill-nets and drift nets by FAO and Colombo Plan Master Fishermen. A two weeks course in

navigation was conducted by a Canadian Colombo Plan Master-fishermen at Trincomalee. Thirty fishermen attended the course.

The Departmental Fishing Vessel "North Star" worked on the East Coast from April to September, 1959, giving training to local fishermen in tuna long line fishing. Five or six trainees were taken out on each trip of about fourteen hours duration. The gear used for demonstration was a set of tuna long line consisting of 200 hooks. Maintenance of both boats and engines of the new mechanised boats given out under the government scheme has been found to be very poor, and steps are being taken to give more training before boats are delivered to operators and to give further training while the boats are in operation when the shortcomings of each operator will be more evident.

A fishermen's training centre is to be set up at Negombo with Japanese aid. The centre will provide training for fishermen in fishing methods and in the operation and maintenance of marine engines. It will also incorporate a repair centre at which also mechanics will be trained in the repair and maintenance of marine engines, particularly diesel engines. This last aspect has been considered to be very important as the number of competent diesel mechanics in the island is very small, and most marine engines are getting unsatisfactory attention at fishing centres from incompetent local mechanics.

In India, two courses of 6 months duration for each course were organized by the Central Fisheries Technological Research Station, Cochin, and officers in charge of mechanized fishing schemes in various states and persons from well-known boatbuilding firms were training in designing and construction of boats. There are two Training Centers in Kerala State, one at Beypore and the other at Ernakulum where selected fishermen candidates are given training in mechanized fishing. The fishermen's Training Center at Ernakulum commenced functioning in June, 1956 and the Training Center at Beypore in September, 1956. The course of training for each group is 6 months and 60 fishermen are trained every year from these two Centers. During the

training, the trainees are given instruction in various methods of mechanized fishing, navigation, seamanship and motor management. The total number of fishermen trained so far is 180.

At present, training is given to fishermen in the use of small mechanised boats and their maintenance in 9 different centres viz. at Veraval (Gururat), Versova (Maharashtra), Mangalore (Mysore), Beypore, Cochin and Quilon (Kerala), Tuticorin and Nagapattinam (Madras) and Kakinada (Andhra Pradesh).

In addition, training is also given in the fishing vessels of the deep sea fishing stations of the Government of India to candidates for obtaining Mate's tickets.

A training course in shrimp trawling has been initiated, the details being as follows: duration of course, 8 months; first 2½ months, lectures and practical; second 1½ months, practical; third 4 months, actual fishing operations.

Lectures will be on the following subjects: classification of trawl nets; terminology; gear materials-selection and use; webbing; kinds of knots, mesh size, length, width, weight of webbing; fundamental knowledge about design and construction including take up-cutting of webbing-joining of two different sizes and shapes of nets; designing of trawl nets: drawing method-interpretation of drawings-4 seaming non-overhang and over-hang trawl nets-2 seaming over-hang trawl nets; relation between H.P. of engine and size of net; otter boards or doors-design and construction; relation between size and weight of otter board and size of net; boats for trawling-characteristics-dock arrangement-stern trawlers and side trawlers; trawl winches-design and mode of working; trawl gallows-design and relative utility; relation between size of boat, H.P. of engine and size of otter door and nets; fishing method-side trawling, stern trawling, trawling speed, length of warp in relation to depth of water; fishing ground; relation between depth of water and size of boat; currents and their effects on trawling; behavior of shrimps; beam trawls for shrimps; bull trawls for shrimps; net mending methods; designing of a shrimp trawl net suitable for the State which the trainees represent.

Practical courses will include: fabrication and construction of net, fabrication of webbing, assembly of hand-made nets, assembly of machine-made webbing; construction of a suitable shrimp trawl for the State which the trainee represents; methods of survey of different trawl nets in use.

The Course during the second four months will consist of actual fishing operations with hand operated trawl nets for 1 month and winch operated stern trawls and bull trawls for 3 months.

In *Indonesia*, a practical training course for fishermen was conducted in the Bangka/Belitung region (South Sumatra). The course lasted three months and had 20 participants. The purpose of this course was to introduce to the fishermen of South Sumatra the use of nets from other parts of Indonesia that so far have not yet been used and were unknown to the fishermen of South Sumatra. In this course, sailing crafts were used.

Another practical training course for fishermen has been opened in Padang (West coast of Central Sumatra). In this course 2 motor fishing-crafts are used. The purpose of this course is to teach the fishermen the use of motor fishing-crafts and how to catch fish with them, to train the fishermen to be navigators, and to train the fishermen to be engine-drivers. The course will last one year and is attended by 4 groups of fishermen each consisting of 6 men.

An engine-driver's and navigator's course for fishermen has been opened in Djakarta. The course will last 3 to 4 months and is being attended by 15 persons.

In *Korea*, for the training of fishermen, a seaman's training school was opened in July 1953 and has already produced more than 10,000 graduates, all of whom are engaged in the merchant marine and fishing industry. In the school, two courses are offered, one regular course, the other, a special course. The school trains the temporary and permanent fishing boat skipper, and chief engineer (B & C grade license for fishing vessels is granted after examination) and is divided, for this purpose, into navigation course and engine course, teaching all the required subjects for license requirements.

In the *Federation of Malaya*, the Second Fishermen's Training Course for 1959 started on April 13th and ended on 26th June. Nineteen trainees from various parts of Malaya attended. In addition to the normal instruction on navigation and engine repairs the trainees were given lectures on general aspects of the fishing industry and on different types of fishing gears and were taken to sea for practical training in handling of fishing gears. The Junior Technical Instructor left Malaya on 10th April 1959 on a 3 months study-course in Japan made possible by facilities provided by the Yanmar Diesel Engine Co. Ltd., Japan. In spite of the added burden thrown on to the remaining staff by his absence, the examination results were very satisfactory. The Marine Department has now sufficient staff to undertake examinations for Helmsman's Certificates and the trainees are again taking the examination. Of 19 trainees, 17 passed the Departmental Examination in Navigation and 15 the Departmental Examination in Engine Care and Maintenance. Fourteen trainees sat for their Engine Drivers' Certificate and all passed; 8 sat for Helmsman's Certificate and five passed; The third Fishermen's Training Course for the year was held from 29 June to 25 September 1959. Fifteen fishermen from various parts of Malaya attended the course. The scope of the course has been extended to include short talks on fishery biology, freshwater fisheries, preservation of fish and cooperative principles in addition to the main studies in helmsmanship and engine maintenance and repair. Of the 15 trainees, 13 passed the Departmental examination in Engine Care and Maintenance and of these 13, all sat and passed the Government 3rd Class Engine Driver's Examination. Nine of the trainees sat for the Marine Department Helmsmanship examination and 4 passed.

Three more courses in the care and maintenance of Engines, in Helmsmanship and training at sea, were held during 1960. A new school for training fishermen in navigation has been opened at Glugor. The modern buildings and equipment, and the added space will enable a bigger intake of candidates, and a more comprehensive training programme for 30 students for 3 years.

The Fisheries School at Sebrang Takir in Kuala Trengganu was completed in June 1960. The school will take in 30 students at each 3-month course.

In *Netherlands New Guinea*. The practical training given at the fisheries experiment stations comprises both sea and shore duties. The Hollandia Junior Nautical School provides practical and theoretical training courses for fishermen in navigation, engine operation and seamanship. At present, six graduates from the Hollandia Junior Technical School are attending a vocational boat building course at Auki, Malaita, Solomon Isles. In addition, a number of fishermen will be sent to the Sub-Regional Fisheries Training Course to be held in the Tulagi Island (Solomon Isles) in the middle of 1961. Both courses are held under the auspices of the South Pacific Commission. As a basis for the various activities, the Netherlands New Guinea Government has established 2 fisheries stations in the Geelvink Bay region, namely:

- (1) in the island of Insobabi, south of the Soepiori coast and west of the Schouten Islands, which has been in operation since, 1957;
- (2) at Seroei, the principal town of Japan Island, covering the Waropen coast and operating since early in 1960.

Both stations are supervised by Dutch technical officers, assisted by indigenous fisheries officers. These stations are active in various fields, such as:

- the supply of fishing gear and salt;
- assisting in the buying-up and disposal of the catch;

In addition, at both stations a motor vessel is available for the practical training of fishermen in the operation of the vessel and the engine as well as in navigation.

In *Pakistan*, no regular school or center for training of fishermen exists in the country. They are, however, offered facilities to learn mechanized fishing on board the departmental exploratory vessels. Fishermen, in batches of two

and three are taken on board these vessels to be trained in the operation of the winch, rigging of the trawl equipment and the gear, webbing joining and net mending methods, elementary navigation etc. More than 30 fishermen have so far been trained including 18 from East Pakistan and all of them now man private trawlers.

In *Hongkong*, eighteen fishermen trained by the Department obtained certificates of competency as coxswains; 9 candidates from engineering classes passed the Marine Department examination and are now qualified fishermen engineers. Nine fishermen joined the 9th Skipper Class, which commenced on 27 April, and navigation training continues. Demonstrations and lectures on the cutting of machine-made sheet net and sewing to form shrimp nets were given to 36 fishermen at Aberdeen Fisheries Office. A considerable amount of fishing with dynamite is carried out by the Pa Teng and purse-seine-net boats in Colony waters and Chinese territorial waters for Mackerel Scad, Anchovy, Green Pilchard and other species of fish. An educational and information programme against the use of dynamite was conducted through the coxswain and engineer classes. An educational film on the danger of dynamite and its effect on fisheries resources was prepared and shown to gatherings of fishermen in the main centres.

In addition to the training programme described earlier in this Report, training classes in net making were organized from December 1958 to March 1959. These classes were designed to train fishermen in a new method of net making by cutting machine-made cotton netting and sewing the pieces together in the form desired, in place of the present time-consuming method of braiding the net mesh by mesh. Pamphlets and lecture notes description of the cutting method were distributed to fishermen in the classes and practical demonstrations were given by Fisheries Department staff.

In *Singapore*, Japanese will give training to local fisherman in the technique of pair trawling.

In November 1958, at Tg. Kling, a Pilot Fisheries Training School was started to evaluate the response and power of assimilation of knowledge by the children of the fishermen from a typical fishing village.

Initially 43 boys from the age of 14 upwards were recruited. A foreman mechanic, a Junior Assistant Technical Officer, and four Fisheries Subordinates were in charge of the class. About half of the students left during their course to seek employment.

Five subjects were taught at the school, namely:

- (a) Elementary hydrology
- (b) Gear and fishing technology
- (c) Canning and preservation of fish
- (d) Engine repair and maintenance
- (e) Carpentry and boat building.

Under the subject elementary hydrology talks were given on the physical features of the region, tides, drifts, currents, chemical composition of sea water, temperature of sea water, common marine animals and life cycle in the sea.

Gear and fishing technology was taught as a theoretical and practical subject. The students were taught various types of twines, fibres, ropes, wires, other fishing materials, their construction and their uses in the fishing industries.

Fishing nets, long lines, floated long lines, fish pots were constructed. The completed gears were utilised by the students for fishing. In this way students were taught to be familiar with more than one type of fishing gear.

In fish canning talks were given on the construction of the containers, preservation and preservatives, causes of spoilage, vacuum, retort pressures, and simple economics of canning. Sprats and mackerels were canned in oil and curry during the practical sessions.

Engine repair and maintenance was taught in theory and practice. Individual parts of engine were exhibited and their functions relating to other parts of the engine were explained. The

parts were assembled and the working was shown on a cut out engine. Two-stroke and four-stroke engines were stripped and assembled. Finally the fishermen in the surrounding villages were encouraged to bring in their engines for repair which was done free of charge. Over 100 small H.P. engines were brought in for various repairs. This gave the students tremendous opportunity to study the causes of failures and their possible prevention and to carry out practical work on engines.

The last subject to be taught at the Fisheries Training school was carpentry and boat building. Elementary carpentry was first taught to familiarise the students with the types of wood, construction of wood and wood grains, preservatives for wood, and uses and care of tools.

After two months of elementary carpentry, the students were taught to take the lines from any boat of their choice. When they had gained a fair knowledge of what was required they were asked to take the lines from a boat which had proved to be good by its performance. Then skeletal work was allowed to commence and the boat was built up. It is the practice of the Malay boat builders to build their boats on the 'Carvel' system where the hull is built first and the ribs inserted later. The students constructed two boats in this manner.

At the end of the course the students were able to construct, line for line, any boat that had proved seaworthy. Prior to this, Malay boat builders depended only upon their experience and visual judgement and lacked the means to improve their knowledge of boat construction.

2.7 Research Activities

2.71 Research institutions

In *India*, a Central Fisheries Technological Station with a craft Division has been set up. Experimental fishing is undertaken in the deep sea fishing and off-shore fishing stations. Researches on the craft and gear are carried on at the Central Fisheries Technological Research Station.

In *Japan*, research in the design of fishing boats is mainly carried out by the Fishing Boat

Laboratory in collaboration with the industry and boatbuilding yards. The Fishing Boat Laboratory is being transferred to the Tokai Regional Fisheries Research Laboratory. In Korea, the Fishing Section of the Central Fisheries Experimental Station, Pusan, and its regional substations have design of boats as one of the activities in their program of work.

In the field of fishing gear, research in designing of new types of gear, testing of gear materials, preservation, detection of fish, attraction of fish, etc., are being carried out at the Fishing Gear Section of the Tokai Regional Fisheries Research Laboratory, Tokyo. Some of the work is described in the Technical Papers submitted at the current session of the Council (Ref: IPFC/C61/TECH 13, TECH 14, TECH 15).

In Korea, the Fishing Section of the Central Fisheries Experimental, Station, Pusan, is mainly concerned at present with exploratory fishings and demonstration of new techniques of purse seining, shrimp trawling, scallop dredging, as well as designing of a new type of combination fishing boat.

In India, the Craft and Gear Division of the Central Fisheries Technological Station is carrying out research on preservation, designing of gear, exploratory fishing, designing of new types of craft, etc.

The experimental stations with six new motor-driven vessels form a new part of the extension work in *Netherlands New Guinea*. The research work performed at the experiment station aims at setting up an indigenous fishing industry which, deducting all operational and administrative costs involved, will be able to operate on a remunerative basis. For the time being, the experiment stations are being used as crew training institutions. It will be necessary to adapt the research work to the current conditions on the basis of results achieved and the inevitable setbacks in its performance. Research into catching techniques involves the improvement of the present fishing methods, by improving vessels and gears for the purpose of increasing the catches per vessel, or the trying-out of methods for the same purpose; and furthermore,

the research for new fishing grounds by means of the present or new methods. In so far as the funds permit, this research work is carried out by the fisheries stations.

In *Pakistan*, besides Central Fisheries Department there is no other institution which undertake craft and gear research. This research is at present confined to the following aspects:

- 1) Mechanization of the fishing craft.
- 2) Introduction of suitable exotic gear.
- 3) Location of fishing grounds.
- 4) Training of fishermen in mechanized fishing.

This research is conducted with the help of two exploratory vessels, the details of which are given below:

	<i>Machhera</i>	<i>New Hope</i>
Length overall	57'	38'
Beam	19'	11.6'
Draft	6'	4'
Tonnage	60	14.9
Engine	150 H.P.	83 H.P.
Hold capacity	23 tons	—

2.72 Research Programs

In *India*, the following are summaries of some of the papers published during 1959/60 in the field of fishing gear.

Miyamoto, H. and Shariff, A.T. Preliminary Investigations on Sun-Hemp Twine as a Fishing Net Material, *Ind. J. Fish.*, Oct. 1959, pp. 397-398.

1. Preliminary investigations were carried out with sun-hemp net twines on the breaking strength, elongation in dry and wet conditions and on the rotting qualities during continuous submersion.

2. The results obtained are as follows:

- (a) The approximate weight (in mg.) of sun-hemp twine per metre is given by 0.33 N. Here N represents the number of 31's yarn. The approximate weight (in mg.) of sun-hemp twine per metre is also given by

0.55 D^2 . Here D denotes the diameter of twine in mm.

- (b) The approximate breaking strength of the twine in kg. is given by 3.66 N in dry and 4.1 N in wet condition; 11.25 W in dry and 12.6 W in wet condition; and 6.2 D^2 in dry and 6.94 D^2 in wet condition. Here W denotes the weight of twine in gm. per metre.
- (c) The average breaking strength of sun-hemp twine in wet condition is 1.12 times more than in dry condition.
- (d) The sun-hemp twine is stronger than Indian cotton twine twisted locally and weaker than manila twine.
- (e) The breaking stretch of sun-hemp twine does not differ much with the thickness of the twine in dry condition, but in wet condition the breaking stretch increases with the thickness of the twine.
- (f) The decrease in breaking strength of sun-hemp twine after continuous immersion in water for a certain time is proportional to the radius of the twine.
- (g) The resistance of sun-hemp twine to rotting is considerably poorer than that of cotton twine and manila twine.

If fibre of select quality is made into twine of uniform thickness and twist, the sun-hemp twine can be improved considerably.

Kuriyan, G.K. and Cecily, P.J. (Miss). The common characteristics of cotton fishing net twines—A Preliminary Account, *Ind. J. Fish.*, Oct. 1959, pp. 399-409.

Gopalan Nayar, S. Preliminary Studies on the Characteristics of Coir Twines, *Ind. J. Fish.*, Oct. 1959, pp. 410-415.

The weight per metre, number of twists and breaking strength and breaking stretch (in dry and wet condition) of five different grades of coir twines have been studied.

The weight of twine per square mm. diameter of the various twines does not fluctuate widely except for Real Alapat variety.

Unlike other fibres of vegetable origin, the coir twines lose breaking strength by 5-24% in the wet condition.

Alapat variety is stronger than Anjengo, Real Alapat variety stronger than Imitation Alapat and Superior Anjengo stronger than Ordinary Anjengo and Special Mangaden stronger than Ordinary and Superior Anjengo.

The breaking strength of coir twines in dry and wet condition is lower than that of sun-hemp twine.

Shrimp trawling has been introduced in *West Pakistan*, as a result of successful demonstration by the departmental vessels. Prospective shrimp grounds from where as much as 60,000 lbs. of shrimps have been caught by the commercial trawlers in 5-6 hours fishing time, have been located as a result of research by these vessels.

In *Hong Kong*, a pair trawling resistance test was performed with Fisheries Division Vessels. Readings on two spring-balances for one warp were recorded. Tests were carried out under varying conditions.

Investigations were made of the possibility of using a native type pair-trawl with otter boards for inshore waters. This work was undertaken by F.D.V. No. 2 ('Yuen Ling'). The ground rope of this net using 20 lbs. of lead sinkers was replaced with a combination of wire rope and manila rope. The results obtained were not satisfactory because the combination rope was too heavy and sank into the muddy bottom.

Very good results were obtained with the native pair-trawl net using a pair of otter boards, each measuring 6' 6" $\times$ 3' 8" $\times$ 2". After investigation and demonstration this pair of otter boards were given on loan to a trawler fisherman for trial with his pair-trawl-net operating in the off shore fishing ground. He has since made his own otter boards and favours this type of fishing.

Work was continued with the small Japanese type pair-trawl made last year using F.D.V. No. 1 and No. 2 in pair trawling. Very

satisfactory results followed the extension of the warps from 120 fathoms to 240 fathoms each.

A synthetic fibre twine 'Courleme X3' obtained from the United Kingdom was used to make a shrimp net. After several trials over a period of several months, the net was still in good condition. It was also found that this net was free from mud during fishing, had good abrasion resistance, and was stiff enough for a trawl net.

Some experimental work with gill nets in Hawaii, U.S.A., was done during September and consisted of sea tests of a grill net, 304 × 50 fathoms (556 × 91.4 m.), made up of panels of mesh sizes from 4½ to 7½ inches (114 to 191 mm.). The objectives were: to ascertain whether or not schools of skipjack tuna could be surrounded by such a net and, further, to see that if a school were surrounded, whether the fish would descend as deep as 50 fathoms and escape beneath the lead line or whether they would be gilled.

Four schools were surrounded and from these only ten fishes were taken, two in one set and eight in another. There was no clear evidence that the fish escaped beneath the lead line or that they did not, or around the end of the net, or even though the larger meshes, even though the lower portion of the net did reach the thermocline in some of the tests.

Some further work is planned in which attempts will be made to attract a school of tuna with live bait through a monofilament nylon gill net.

While this work may be considered as gear research, it was motivated in substantial part to study the behavior of tuna in relation to barriers of unsubstantial appearance, such as a gill net, and the thermocline.

3. DOCUMENTATION

3.1 The Second World Fishing Boat Congress

During April, the Second World Fishing Boat Congress was held in Rome in which more than 300 participants from upwards of 40 countries took part. A Summary Report of this Conference as well as a review of the book "Fishing Boats of the World (2)" based on the above Congress was circularized to the Technical Committee members.

3.2 Otter Trawling

A detailed Report describing the work of an FAO fishing gear technologist on the development of an improved one-boat mid-water trawl was sent to members of Technical Committee II, Panel A.

3.3 Symposium on Improved Types of Fishing from Small Boats

Copies of the proceedings of the Symposium on Improved Types of Fishing from Small Mechanized Boats held in Cochin, India, during October 1958, procured from Government of India, were circularized.

4. PERSONNEL OF THE FAO REGIONAL OFFICE FOR ASIA AND THE FAR EAST

Regional Fisheries Officer (Craft and Gear), Bangkok.

No action has been taken by FAO due to budgetary restrictions.

Part B

The Council's Review of the Inter-session Report and Recommendations arising therefrom

- I. RESEARCH ON CRAFT AND GEAR
- II. MECHANIZATION
- III. CRAFT DESIGN, CONSTRUCTION & MATERIALS
- IV. ENGINE SUPPLY, PROCUREMENT & MAINTENANCE
- V. PORTS, SAFETY REGULATION & WEATHER FORECASTING
- VI. GEAR DESIGN, SUPPLY AND PRESERVATION
- VII. FISH DETECTION
- VIII. TRAINING OF BOATBUILDERS AND FISHERMEN

RESEARCH ON CRAFT AND GEAR

The Council noted that there has been an expansion of research activities in this field in some Member countries, and strongly recommended that such research activities should be promoted also in other countries of the Region.

MECHANIZATION

The Council noted that the progress in the mechanization of fishing craft, or rather in the introduction of mechanized boats, is gaining momentum. As regards the choice of engines, inboard engines are given preference to outboard engines, full Diesel to semi-Diesel or petrol engines, hand to air starting or electrical starting etc. depend on the use of various horse-powers and water cooling to air cooling. The high expense of the fuel is considered the main disadvantage of petrol outboard engines. There is, however, a considerable amount of interest in the recent development of Diesel outboard engines for the mechanization of some types of indigenous craft not suitable for the installation of inboard engines. The Council therefore decided to ask FAO to keep the Member Governments informed about the development, technical characteristics, availability and prices of such engines. The results of eventual future experiments in

the region with such engines should be communicated to all Member Governments as soon as possible. The Council noted that in Australia fuel used in the fishing industry is exempted from duty. In order to make fuel oil available to fishermen at cheap rates the Council recommended that Member Governments consider the feasibility of abolishing duties and taxes on fuel oil used by fishing craft.

The Council noted with satisfaction that the introduction of mechanized fishing craft in all Member countries has led to an increase of catches and consequently higher income for fishermen without affecting the employment situation. It is, however, felt that a quantitative evaluation of the economy of fishing with mechanized craft if applicable in comparison with the conventional boats, is highly desirable as a base for the planning of Governmental development schemes.

The Council felt that it was its duty to bring to the attention of the Member Governments that introduction of mechanized handling of gear is most unlikely to affect the employment situation regarding the crew. Since mechanical aids are in many cases indispensable and have always led to increased fishing efficiency, the Council urged the Member Governments to place more stress on the introduction of mechanized handling of gear.

In the field of fishing craft and gear, the Council, while noting with satisfaction the rapid headway the Region as a whole is making in the modernization of its fishing industry, felt that a quantitative evaluation of the effects of modernization would serve as guidance to Member Governments in their formulation of schemes for development. Therefore, the Council decided to ask FAO to collect the relevant data from Member Governments and prepare a comprehensive review of the effects of mechanization of craft and gear on fish production as well as the socio-economic condition of the fishermen in the Indo-Pacific Region. The Council urged the

Member Governments to cooperate with FAO in the collection of the relevant information.

DESIGN, CONSTRUCTION AND MATERIALS

The Council noted that considerable progress is being made in the Region in the design and construction of fishing craft with due consideration to economy. It is now generally accepted that mechanization is one of the most efficient means for improving the fishing economy. As an intermediate step and to facilitate the later introduction of motorized vessels proper, existing boats suitable for this purpose are gradually being equipped with engines and, if necessary modified accordingly. Apart from that, and particularly in areas where the indigenous craft is not suitable for motorization or for operation in fisheries to be developed, new types of motorized boats are being developed. The Council felt that in order to simplify not only the training of the fishermen but also the production by local boat yards so far not familiar with such type of craft, the restriction to a limited number of standard types of craft is desirable. Under certain conditions one boat trawling was found more profitable than pair trawling. The Council noted that in Hong Kong, as a preliminary step, pair trawlers have been converted for one boat side trawling and a 65 ft. wooden stern trawler is being considered for construction to investigate the economic aspects. The Council observed that the comparative advantages of one boat trawling or pair trawling depend largely on factors of engine power available and the particular fishing conditions. Trawlers should therefore be constructed so that they can be used for both methods at will.

The Council studied with great interest the experiences collected to date by trials with different types of mechanized surf landing boats in India as described in CP20, but which have so far not led to fully satisfactory results. To overcome excessive wear of the stern bearing which is one of the technical problems also in other motorized boats in the area, FAO is testing a jet propulsion unit. The feasibility in certain areas of by-passing the intermediate stadium of mechanized surf landing craft, and rather con-

centrating on the provision of facilities and the further development of boats for operation from harbours or sheltered mooring grounds was discussed. The Council consequently requested FAO to obtain information regarding the interest of Member Governments in mechanized surf landing craft and the conditions under which such craft would have to be operated.

The Council showed great interest in the use of fiberglass-plastic for construction of fishing craft, particularly in countries where suitable wood is not available, and asked FAO to provide the Member Governments with all information available particularly with regard to experiences in tropical countries with such craft. The Council further asked FAO to investigate the possibilities of providing one boat in the Region for testing purposes under the supervision of an FAO expert

ENGINE SUPPLY, PROCUREMENT AND MAINTENANCE

The Council considered that the import of marine engines is one of the main problems regarding the introduction of mechanized fishing craft in several Member countries. The indigenous production or assembling of engines is therefore desirable. At least in the beginning this can, however, only be done by licenced production or in close collaboration with foreign manufactures. In one case a locally assembled engine was considerably more expensive than the imported unit. The Council also discussed the various advantages and disadvantages arising particularly from the need for selecting one or a limited number of makes and types of engines for a larger area. The advantages of having a limited number of types of engines are simplification of stock keeping of spare parts, maintenance, repair, operation, training in general. However, the disadvantage of creating a monopoly has also to be taken into account.

The Council strongly endorsed the increased efforts which are being made by Member Governments in giving financial assistance in the form of loans, subsidies and exemption from custom duties and sales taxes to accelerate the introduction of improved mechanized fishing boats. The relative merits of the different ways in which Member Governments tackle this

problem were discussed. The Council strongly recommended that Member Governments should give high priority to financial aid to those fishermen who have no funds and are not in a position to offer adequate security for loans. Hire-purchase schemes or instalment buying combined with subsidies offer a feasible solution, provided that precautions are being taken for regular loan recoveries. Some Member Countries have already greatly accelerated the introduction of mechanized boats by applying such practices.

In order to provide servicing and training facilities for the maintenance and repair of marine engines good results have been obtained by several Member Countries with mobile workshops. Thus many fishing places can be served with one unit only. While trucks are usually being used, in one case so far a workshop and towing boat for servicing a considerable length of coastline is being planned. Such mobile workshops which are operated either by the Government or by private enterprise are considered a very efficient solution at least for the intermediate period until a sufficient number of stationery workshops has been established.

FISHING PORTS, SAFETY REGULATIONS, WEATHER FORECASTING

After reviewing the intersession developments in the planning, designing and construction of fishing ports in the Region, the Council recommended to Member Governments to give highest priority in their development plans to provision of fish harbour and landing facilities in view of the increasing needs of the rapidly expanding mechanized fishing fleets.

The Council reiterated its recommendations made during the 8th Session, that impractically high standards of safety regulations for fishing craft should not be set.

While noting the existence of weather forecasting services for the fisheries in some Member Countries, the Council strongly recommended that similar services should be developed gradually in those countries where they do not exist at present. For instance, weather forecasts

could be broadcast at certain periods during the day and received by the fishing craft by means of inexpensive radio receivers.

GEAR DESIGN, SUPPLY AND PRESERVATION

The Council wished to bring to the attention of Member Governments that FAO is preparing a Catalogue of Gear Designs, containing the most modern and efficient fishing gear of various types being used in the world. The information given in this Catalogue is so detailed that it will be possible to choose a type of gear suitable for other regions and construct it. The Council also drew the attention of Member Governments to the recent publication "Modern Fishing Gear of the World" which contains a great deal of technical information badly needed in this Region, and urged Member Governments to ensure that this publication gets wider distribution to their fisheries officers.

The Council reviewed the present situation with regard to the use of electricity in connection with above water and underwater lamps, including mercury vapor lamps. The Council strongly recommended that low voltage generators of approximately 32 V. should be used for reasons of safety.

The Council heard with interest a statement from the FAO Gear Technologist present at the Session regarding high-opening and mid-water trawls (Tech. papers Nos. 13 & 15) and consequently asked FAO to distribute the *GFCM Studies and Reviews* No. 13 to all Member Governments.

In view of the proven superiority of synthetic material for most fishing gear, the Council recommended that Member Governments should facilitate its introduction by granting exemption from import duties, sales taxes etc. The Council also urged Member Governments to study feasibility of indigenous production of synthetic fishing gear materials. The FAO Gear Technologist referred to the favourable experiences gained elsewhere with the use of synthetic monofilaments for fishing nets.

Although the introduction of synthetic materials is desirable, the Council was aware that natural fiber materials will continue to be used to a great extent in many countries for many years to come. In this connection the Council wished to draw the attention of Member Governments to the desirability of utilizing more efficient preservation methods such as have been developed elsewhere. Knowledge regarding improved techniques using local materials should be given wider dissemination through extension work. This refers also to the treatment of synthetic materials where, for instance, protection against sunlight and abrasion as well as ensuring increased stiffness, knot firmness and increased weight (Tech. Paper 14), is desired.

FISH DETECTION

After discussing the different aspects of fish detection by echo sounding and echo ranging, the Council emphasized that Member Governments should give high priority to testing the feasibility of using this method to increase fishing efficiency. Particular attention should be paid to the economic aspects in the choice of the type of equipment for a particular purpose.

TRAINING FOR BOAT BUILDERS AND FISHERMEN

Only in a few Member Countries, Craft Technicians have been trained (partly with help of FAO/TA Experts) and/or employed by Fisheries Departments so far. Actually the opinions are still not confirmed in regard to the best way

of providing organized training in this field. The advantages of short term assignments of FAO/TA experts or private marine engineers as training officers were mentioned and discussed. The Council realizes that there will be an increased demand for craft technicians along with the increasing number of mechanized boats, and consequently urges Member Governments to consider further the possibilities of how this demand can be met in a way best suited for the particular conditions in the different fisheries.

The Council noted with interest that in Hong Kong a master shipwright has been appointed to give 3 months courses in evening classes, teaching 22 junk builders at a time in advanced boat building techniques including the reading of drawings. It is felt that more should be done along such lines also in other countries of the region. The Council therefore strongly recommended that Member Governments should give more thought to the developing of training facilities in modern boat building work needed for the economic and reliable construction of mechanized fishing craft so far unknown to local shipwrights in many places.

After noting that national training centres have been established on a permanent basis in some countries, the Council urged Member Governments to further extend such training facilities and to establish these in those countries where they do not exist at present. Member Governments were also recommended to offer facilities to enterprising fishermen to study improved techniques in other areas.

CHAPTER IV
FOOD TECHNOLOGY

Part A

*Report on Intersession Activities 1959 - 60
by Technical Committee II, Panel B*

CONTENTS

	Page
INTRODUCTION	140
1. FRESH FISH	140
1.1 Technology of Fresh Fish Handling and Distribution	140
1.11 Icing	140
1.12 Distribution Facilities	142
2. CURED FISH	143
2.1 Fish Curing in Humid Tropics	145
2.11 Improvements in Fish Curing Yards	145
2.12 Fishery Salt Production	145
2.13 Application of Research to Industry	145
2.14 Quality Control	145
2.2 Artificial Drying of Fishery Products	147
2.3 Packaging, Shipping and Storage of Cured Fish	148
2.4 Fermented Fisheries Products	148
3. FROZEN FISH	150
3.1 Techniques Used for Freezing	150
3.2 Cold Storage Facilities	151
4. DURABLE HIGH PROTEIN FOODS FROM FISH	151
5. BY-PRODUCTS FROM FISH	152
5.1 Fish Meal and Solubles	152
5.2 Fish Oils	155
5.3 Fish Liver Oils	155
6. CANNED FISH	160
7. BOILED FISH	161
8. SEAWEED PRODUCTS	161
9. RESEARCH ACTIVITIES	163
9.1 Research Institutions	163
9.2 Research Programs	163
10. DOCUMENTATION	171
10.1 Boiled Fish	171
10.2 Fisheries Products Manual	171
10.3 Dried Fish and Shark Liver Oil	171
11. TRAINING CENTRE IN FISH PROCESSING	171
12. PERSONNEL OF THE FAO REGIONAL OFFICE FOR ASIA AND THE FAR EAST	171

INTRODUCTION

During its 8th Session held at Colombo, 6-23 December 1958, the Council, after reviewing the developments in the fishing industry in its various aspects, made a number of recommendations covering the field of fish processing technology, directed to both Member Governments and FAO.

This Report deals mainly with the action taken by Member Governments as well as by FAO on the above recommendations of the Council. The Report consists mainly of the information contributed by the members of the Technical Committee as well as information gathered by the Technical Secretary during his visits to Member Countries.

1. FRESH FISH

1.1 Technology of Fresh Fish Handling and Distribution

1.11 Icing (proportions used, price of ice, etc.)

The use of ice in the preservation of the catch has increased in most of the countries. The price of ice varies considerably in the different countries and also according to season. The price per ton of ice may vary from less than US\$ 5/ton in *Japan* and *Korea* during winter to as much as US\$ 10 to 12 in many other countries of this Region.

In *India*, researches were carried out on ice storage of shrimp and a paper on this subject is summarized below.

Velankar, N.K. and Govindan, T.K. Preservation of Prawns in Ice and the Assessment of their Quality by Objective Standards. *Ind. J. Fish.*, Oct. 1959, pp. 306-321.

Observations were made on the trimethylamine, total volatile nitrogen, acid-soluble orthophosphate and free amino acid nitrogen contents and bacterial counts of Indian prawns (*Penaeus indicus*, *Metapenaeus affinis*, *M. dobsoni*) preserved in ice. The prawns were found to have a keeping quality of about 10-15 days before spoilage set

in. The period of prime quality as seen from the objective tests employed did not exceed one week. Heading the prawns prior to icing minimised the incidence of black discolouration (melanosis) peculiar to prawns and appears to be an essential step if the desired storage duration is more than 1 or 2 days. Trimethylamine and total volatile nitrogen changes are not significant during the first 10 or even 15 days, and are useful for indicating distinct spoilage. Phosphate and more particularly the free amino nitrogen content reflected the number of days elapsed in ice storage and might be used in assessing the changes in iced prawns before the onset of spoilage. The decrease in the amino nitrogen is due to loss of free amino acids through leaching and since free amino acids are present in crustacean muscle in considerable quantity compared with fish muscle, their loss through leaching may be a contributing factor in lessening the flavour of prawns kept in ice for extended storage periods. The bacterial flora of the iced prawns consisted mainly of Gramnegative achromic rods and coccobacilli, and to a lesser extent, of orange and yellow pigmented rods and micrococci.

In *Korea*, annually about 400,000 metric tons of fish and shellfish are caught. However it is very difficult to store this fish and shellfish before consumption. There is considerable wastage due to spoilage. Proper utilization of the fish and shellfish which will improve the food economy in *Korea*, can be effected if the period of preservation of freshness can be extended. Though the transportation of fresh fish by ice-box holding method is used, it is difficult to install refrigeration facilities in all fishing boats under the present economic situation. Therefore, the Central Fisheries Experiment Station is now carrying out various experiments to solve problems concerning the handling of fresh fish at the sea right after its catch, preservation methods, storage and transporting of fish, and fish market management, etc.: (a) Determine the keeping time in ice of important fresh fish and shellfishes, (b) Utilization of antibiotic ices, (c) Relation between dead and freshness conditions, (d) Washing problem after death, (e) Utilization of preservatives, (f) Disinfection problems of decks and bins in fishing boats, (g) Improvement

and disinfection of fish containers, (h) Investigation on storage of fish in refrigerated water, (i) Improvement of handling fish after landing at fish market, (j) Fresh fish transport problems from the fishing grounds to the fish market. The handling and transport conditions on board the fishing vessels have been improved. Transport by land is not considered as important because geographically the country is surrounded by sea on three sides and it is easy to transport fresh fish by water to most of the places. Only for shrimp, refrigerated cars or trucks are used. The present position in *Korea* is as follows:

(1) Ice-making

In *Korea*, there are 67 ice-making or refrigeration plants, most of them are located at major fishing ports and densely-populated towns, and the total capacity of ice production is 1,600 metric tons per day and the ice storage capacity is 2,400 tons. Twenty-two of the 67 plants have the freezing and cold-storage facilities as well as ice-making facilities with the total freezing capacity of 275 metric tons per day and storage capacity of 8,415 metric tons of frozen foods.

There are a few plants equipped with the newest-type ice machines, and it is expected that a few more ice-making and freezing plants will be established in the near future as the cold storage business develops.

Sixty per cent of all ice production is consumed by fishing boats for holding fresh fish, and the rest, forty per cent, as potable ice; however, in summer, the most productive fishing season, the ice production cannot meet the demand in some districts.

(2) The sale of ice

The price of marine ice, as a rule, is cheaper than the potable ice. In Pusan which is one of the largest fishing ports in *Korea* the price of marine ice is 4,500 Hwan per ton and that of potable ice, 6,000 Hwan per ton though there is some fluctuation of ice price according to the demand. (1 US\$ is worth about 1,300 Hwan.)

(3) Icing method

In *Korea*, the majority of fish catches are stowed in wooden fish boxes capable of holding 37 Kg or 18.5 Kg, and transported to fish markets and processing plants. Of course the exact ratio of weight of ice to weight of fish varies largely by conditions such as atmospheric temperature or desired storage period. Generally in summer, a ratio of 1:2 is common, and in winter 1:3 or 1:4.

In *Malaya*, a general survey of the role played by refrigeration in the fishing industry of Malaya has since revealed the breakdown of consumer prejudice against iced fish and the increased use of ice for preservation. Improved techniques in the icing of fish both at sea and at landing points for marketing and distribution of wet fish has enabled dealers to supply larger quantities of fish to the more important inland markets in a satisfactory state of freshness. In order to meet the demands for ice consumed by both the fishing industry and traders, manufacturers have expanded their ice plants and cold storage facilities besides setting up new plants. There are at present 48 ice factories in the country with a total daily production capacity of approximately 1,100 tons. Storage facilities in these factories include cold rooms for 2,100 tons of ice and 2,500 tons of fish.

It is not possible to assess the exact quantities of ice used by the fishing industry and trade, but it may be safely assumed that the bulk of the production is absorbed by fishermen and fish dealers as all the factories are located in or near to fishing villages or marketing centres. The majority of them are operated along the West Coast which produces nearly two thirds of the country's total fish production.

Generally, the West Coast fishermen and dealers have adequate supplies of ice to meet their demands besides having excellent road transport organisations for fast distribution of iced fish. The factories are well distributed through the coast and can provide cold storage facilities for glut landings as well as regulation of fish supplies throughout the year.

The position on the East Coast however is less satisfactory, both as regards icing and

distribution facilities. While fish production there amounts to one third of the total production, there are only 10 factories along the coast and two in the hinterland of Pahang. Total daily ice production amounts to only 135 tons while ice storage facilities provide for 250 tons, which in both cases amount to only 12½ % of the capacities available on the West Coast. Cold storage facilities for fish amount to only about 100 tons in all the ten factories.

A number of factors account for this comparative deficiency in ice supplies and storage facilities in the East Coast. Among them are :

- (i) the undeveloped nature of the East Coast by West Coast standards,
- (ii) the short distances between the many landing points and consumer areas,
- (iii) poor road facilities for transport of iced fish which consequently reduces the ice for preservation to a minimum,
- (iv) fish landings on the East Coast comprise mainly of cheap types of fish and the expenses involved in icing and transport is not in any way an economical undertaking,
- (v) fishing operations are curtailed for at least three months in a year during the North East Monsoon, and this inevitably results in the ice being left unsold during this period,

From the fishermen's and dealers' point of view, the price of ice which varies between \$25/— to \$30/— per ton is much too high as charged by most manufacturers. With an additional charge sometimes of \$22/— per ton for the transport of ice from the factory to distant villages, the problem of using ice for preservation of fish discourages fishermen and dealers in many cases. As a result only the more expensive types of fish are iced and transported for distribution.

The solution to the problems may be found by :

- (i) a wider distribution of cheap fish in the vicinity of the landing centre which will not entail expensive transport charges,

- (ii) the establishment of ice factories in close proximity to the fishing villages to reduce transport expenses. However, this again can only be undertaken if fish production in such villages are large enough to warrant the building of ice factories in the vicinity of the fish producing areas.

In *Thailand*, formerly, the fish were brought mostly to Bangkok by boats and trucks, very little by railroads. Ordinary practice is to take ice blocks from Bangkok, and store them in the insulated holds of the boat until the time of icing the fish. Most of the boats will crush the ice by hand, giving a mixture of small and big pieces with poor chilling properties. The fish is normally stored in bulk in the fish holds, which may be from 1.4 to 2.0 meters deep. Better price fish is iced rather carefully with about 1 part of ice to 1 part of fish. Icing of small fish is not satisfactory; the amount of ice used is too small and the mixing is not carefully done. At the market the fish of the first category is carefully separated from ice and displayed for sale, while the small fish is very roughly handled before sale in the 34 liter tub used in the Bangkok Fish Market.

Usually, only the upper 50 to 60 cm. of the fish piled in the hold are of good quality, while further down the fish are in a rather bad condition. Blood and excreta are passed out, supplying a favourable medium for bacterial growth. The fish appear slimy and dirty and quite often a rather high percentage of them arrives with broken bellies. This is considered a serious quality defect and causes the price to drop significantly.

Sometimes the fish is iced immediately after capture and the quality will be better. In other cases the fish is bought from the fishermen several hours after capture, and only inferior quality can be expected.

1.12 Distribution facilities

In *Korea*, most of fish catches are packed in fish boxes with ice, and transported to retail markets by trains or trucks. Only special fishes such as shrimp and frozen fish are transported by

refrigerated cars or trucks. Some years ago, Central Fisheries Experiment Station had designed an insulated container for transporting frozen fishes. However, transportation by land is not considered as important because geographically *Korea* is surrounded by sea on three sides and it is easy to transport fresh fish by water to most of places.

In the flourishing fishing seasons, the fishing boats do not transport their catches but the fish transporting boats go round, collect the fish catches and transport them to the markets.

In *Malaya*, only one leading Chinese distributor in the State of South Perak operates two refrigerated trucks for distribution of fresh and boiled Chub Mackerel to the Kuala Lumpur and Singapore markets.

In *Thailand*, there was formerly one cold storage in the old Fish Market and another one at the mouth of the river. There are no refrigerated or insulated means of transportation on land. A considerable portion of the fish is transported by uninsulated trucks. The fish are usually packed in wooden boxes, in ice. Practically all the fresh sea fish marketed in the inland provinces are iced and packed in Bangkok and shipped by rail. Very large quantities of ice have to be used, as the railroads have neither insulated nor refrigerated cars or containers. Furthermore as there are no chilled holding rooms at the points of destination the consignments have to be disposed of promptly.

To improve fish handling, the government has established a whole-sale market for fishery products and a cold storage of 800 tons capacity, with facilities for landing the fish. While to improve the quality of fish, the technology section have encouraged the fishermen to install ice-crushers on carrier boats and fishing boats, asking the boat operator to use more ice and reduce the storage pressure in the deep fish holds by introducing wooden boxes for packing the fish, to ice the fish immediately after death and to check the quality of fish by organoleptic test at the Bangkok Fish Market and retail markets.

It is also planned to introduce certain quality standards for fresh fish at the Bangkok Fish Market, while the retail market will have also more facilities such as running water, ice and refrigerated display cabinets and containers. The Thai Railway Organization is ready now to start fish transportation into inland towns when cold storage facilities at the terminal are ready. The expansion of fish landing places, new markets near the fishing centres, and cold storage is also planned.

2. CURED FISH

(See also IPFC Fisheries Products Manual, IPFC/C61/WP 8)

In *Japan*, the amounts of production of processed marine products for marketing are as follows:

(Unit: Metric tons)

	1953	1954	1955	1956	1957	1958
Grand total	1,143,763	1,229,345	1,391,195	1,453,216	1,653,032	1,787,991
For food use						
Total	1,026,316	1,096,121	1,195,967	1,289,351	1,460,011	1,527,712
Simply dried	85,789	81,490	69,674	44,040	51,049	49,312
(Squid	51,251	53,928	51,119	30,476	33,721	33,464)
(Shark fin	584	818	645	762	1,024	697)
Salted and dried	62,103	75,539	89,264	100,606	110,785	106,720
Boiled and dried	113,178	107,258	113,789	109,953	131,745	125,984
(<i>Iwashi</i>	85,947	79,289	84,770	83,181	97,255	90,834)

(Unit: Metric tons)

	1953	1954	1955	1956	1957	1958
Smoked and dried	1,394	1,010	711	1,283	1,791	4,474
Salted	77,870	103,562	93,654	72,011	79,179	83,712
(Salmon	20,558	18,293	40,763	31,114	38,591	45,937)
<i>Fushi</i> , dried strips of fish	40,405	58,701	58,859	65,464	68,059	73,023
<i>Rensei hin</i> , fish jelly products	226,683	270,958	306,754	369,637	434,153	436,592
Frozen fish	277,328	232,778	300,341	330,758	373,902	434,817
Seaweed products	51,645	55,469	53,647	56,422	61,232	55,991
Others	89,968	109,354	109,275	139,176	148,115	157,087
(<i>Tsukudani</i>	73,374	88,787	89,805	117,992	128,052	132,143)
(Agar-agar	2,329	1,829	1,646	1,682	1,801	1,813)
(<i>Shiokara</i> , fermented fish products	5,394	4,984	4,849	4,876	4,204	5,345)
For manure and feed, fish cake						
Total	95,598	103,739	141,584	134,310	156,793	212,369
Fish meal	—	19,286	41,349	41,303	61,677	58,262
Saury cake	—	—	—	29,421	24,429	44,840
Aquatic animal oils						
Total	21,844	29,484	53,646	29,553	36,228	47,909

In *Malaya*, the fish curing industry absorbs nearly 20% to 25% of the total wet landings annually for processing into various forms of cured fish and fish by-products. They form the main protein food among the poorer class of the population and are taken with their meals in a variety of ways.

Dry salting is still the most common form of fish processing and accounts for nearly 55% of the cured fish in this country. Some types of fish like the red snapper (*Merah*), queen fish (*talang*), sea catfish (*duri*) are usually salted as they are less saleable as fresh fish. Sardines (*tamban*), scads (*selayang* and *selar kuning*) and jew fish (*gelama*) fetch good prices in the salted form and for that reason are normally salted and sold as cured fish rather than as fresh fish.

Another popular form of processing is boiling in brine followed by sun drying. This method is used in the case of anchovy (*bilis*) and prawns (*udang*). In addition to these two

forms of processing, chub mackerel (*kembong*) is boiled in brine, but is not sun dried and sold as such. This method is used as a temporary measure of fish preservation by purse seine operators in the State of Perak. The boiled fish is kept in extensive cold rooms that are available all over the country.

Other forms of processed fish include fermented shrimp paste (*belachan*), pickled shrimps (*chinchalo*), fermented anchovy (*budu*), prawn or fish crackers (*keropok*) as well as thick sauces which are made as by-products at prawn curing establishments, and known as "Her Koh".

In *Thailand*, annually, the total catch of fish in *Thailand* is estimated at some 171,000 metric tons of marine fish and 63,500 metric tons of freshwater fish, and probably half of the marine catch is consumed fresh. The other half is processed in a number of ways, such as boiling, drying, smoking, production of paste and nampla by fermentation and fish cake. In addition there

are a few small canneries, two fish liver oil pilot plants and three continuous-type fish meal plants, with numerous cottage-scale-type plants.

2.1 Fish Curing in Humid Tropics

2.11 Improvements in fish curing yards

In *India*, in the States of Kerala, Bombay and Mysore a number of fish curing yards have been constructed at important landing centres along the coast. These curing yards have facilities for curing fish under hygienic conditions. Fish curing and drying is done under the supervision of the departmental officers. Good quality salt is being supplied at cheaper rates at these yards. Water for cleaning the fish and facilities for drying and curing fish on cement floors are provided at these yards. Demonstrations are also arranged for the benefit of the fishermen regarding improved methods of curing.

In *Malaya*, almost all forms of salted fish and prawns are sun and wind dried, and are either done on raised wooden platforms or straw mats of Pandan leaves. So far there has been no use of mechanical driers in this country.

2.12 Fishery salt production

In *Malaya*, all salt used in fish curing yards is imported Arabic salt as no salt is produced in this country. The flavour imparted by the cheap Arabic salt is highly relished by the local population although the product by Western standards may be termed 'poor' in taste, odor, appearance and keeping qualities. Generally the cured fish products have a high salt content, as this renders palatable a diet largely composed of carbohydrates, in particular rice, besides improving the keeping qualities in a humid climate.

2.13 Application of research to industry

In *Thailand*, fish salting, drying and smoking were formerly undertaken in a primitive way. There were no restrictions about moisture and salt content, with the result that often salted fish for export were spoiled on the way to their destination. Drying under the sun is the only way for drying fish in this country; in good sunshine, one full day's drying will be enough

for local market and two days for export. The smoking of fish is not done in a close smoked house; the product is very dry and only fresh-water fish are used. The Technology Laboratory has studied carefully the existing methods of preparing various fish products by visits to the plants and has undertaken laboratory studies to improve the quality, and several improved processing methods have already been passed on to the industry.

In the salting of fish for export, an inspection and control of the quality of all salted, dried Rastrelliger is established. The keeping qualities of the product are studied, and the limit of the moisture and salt content of the salted, dried fish is fixed. A quick method for the determination of moisture has been introduced and a complete report on fish salting was circulated to the trade.

2.14 Quality control

In *Japan*, researches have been carried out on flies infesting fish spread or hung out for drying and the results are as follows:

Makoto Takei. Study on the Protection from Harm by House-Fly on Marine Products-I. Infestation of House-Fly on Fish Meat. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 24, June 1959, pp. 27-37.

The purpose of the present experiment is to obtain a preliminary knowledge for establishing efficient methods to protect marine food from house-fly infestation. In an early phase of the experiment on which this paper is based a different tissue of fish was laid under every one of several fly-traps made of glass. After those samples had been left outdoors for a given number of hours in the daytime, the numbers of flies that had been attracted to the sample tissues and eventually entrapped into the glasstraps were compared according to the quality of each sample. The following are the results thus obtained.

1) In case of fresh meat, common mackerel seems to attract flies a little more than horse mackerel, flatfish and squid. Probably, however, the differences observed to that extent may not be evident enough to prove the selectivity of

kinds of fishes that the fly shows in its infestation. On the other hand, flies would swarm on a piece of stale meat of flatfish and squid oftener than of common mackerel and horse mackerel.

2) The infestation of fly on fish meat increases with the progress of deterioration in the meat.

3) Among various anatomical parts the number of flies having gathered on the intestines and pyloric coeca was the greatest. Next to those, flies were frequently attracted to the head, gill, red muscle, blood and liver. Common muscle and gonad attracted flies but less than the tissues enumerated above.

4) Generally the flies do not gather on fish meat having water content lower than about 50%.

5) For flies a preferable range of NaCl content in the meat seems to be 1 to 3%, as they did not come to the meat containing NaCl more or less than that range.

6) Flies appeared to avoid smoked fish meat. One of probable reasons for the inhibition is attributable to odors of creosote, cresol and phenol that the smoked products have.

7) The infestation of flies on dried and seasoned meat varied, depending on kinds of seasoning liquors used. Usually flies preferred non-seasoned meat to seasoned one.

8) Although green-bottle blowflies gather at an object colored in white or yellow, the preference of kinds of colors by blue-bottle blowflies or fleshflies was found obscure.

9) At a place elevated about 10 meters above the ground, green-bottle blowflies coming to fish meat were not so many as on the meat laid on the ground. The infestation of blue-bottle blowfly or fleshfly is independent of the height of a place where the meat is kept.

Makoto Takei. Study on the Protection from Harm by House-Fly on Marine Products—II. Smell Attracting House-Fly. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 24, June 1959, pp. 39-46.

The relation between smell emitted from fish meat and the number of flies attracted to the

meat was also studied. The results obtained can be summarized as follows.

1) In outdoor experiments using fly-traps, each furnished with different odorous reagents, flies seemed to be attracted to the smell of such substances as acetone, ethyl acetate, acetic acid or butyric acid.

2) When the relation between the smell and the fly infestation was studied indoors by the use of an olfactometer, the results did not always agree with those from the outdoor experiments, because flies appeared to be lured to trimethylamine and methanol more frequently than to acetone, lactic acid and butyric acid.

3) In case of stale meat the ethanol extract attracted more flies than the remainder of the meat while in case of pyloric coeca, *vice versa*. In the extract from stale meat, they were attracted to acidic fraction more than basic fraction of the extract, while, in fresh meat, they seemed to prefer basic fraction to acidic fraction of the extract.

4) Around fish intestines and stale meat, female flies swarmed more than male, and the same was observed with trimethylamine and pyperidine. On ethanol, males gathered more than females.

Researches have also been carried out on the use of preservatives for fishery products.

Sogo Tetsumoto, Tomoaki Okitsu, and Masahiko Fukuda. Studies on Preservation of Marine Products by Chemicals—II. Comparative Test of Bactericidal Effect of Nitrofurans Derivatives and some Preservatives. *Bull. Jap. Soc. Sci. Fish.*, Vol. 20, No. 12, 1955, pp. 1099-1104.

In the present report, the bactericidal effect of nitrofurans derivatives is examined as compared with some chemicals already used for food preservative such as P-hydroxy butyl benzoate, salicylic acid. Nitrofurans compounds are found more effective in low concentration than usual food preservatives and upon the bases of these observations, a method of application of the compound for fish and fish products is also discussed.

Sogo Tetsumoto. Studies of Preservation of Marine Products by Chemical Preservative—IV. Effect of Nitrofurane Compounds on the Keeping Quality of Raw Fish and Shellfish *Bull. Tokai Reg. Fish. Res. Lab.*, No. 23, Feb. 1960, pp. 65-91.

Though the derivatives of nitrofurane compound indicate a fairly remarkable prohibition on the growth of common micro-organisms related to fish spoilage, the present test reveals that the effect can be enhanced when the drug is coupled with some other chemicals such as sodium nitrite or parahydroxybutylbenzoate. However, the combination of sodium nitrite and parahydroxybutylbenzoate was found not to give any increase of inhibitory action than the single use of each component.

The bacteriostatic capability of the combined preservative which consists of nitrofurane compound and one of the above agents can stand longer if the reaction of the solution is adjusted to pH 3.0 with HCl, the concentration of which makes little damage on the quality of fish due to acidification.

In case of single usage of nitrofurane compound, a minimum concentration to obtain a preservative effect could be suggested as 0.003%, while for the coupling application, 0.1% sodium nitrite or 0.02% parahydroxybutylbenzoate will be recommended to be added to the main preservative, 0.003% nitrofurane compound, for practical purposes.

In *Malaya* there is no rule as the kinds of fish which may be salted or dried on any part of the Malaya coast-line. Any fish suitable for human consumption is generally salted and dried if no immediate outlet to the fresh market exists. Hence, grading of products in this trade is complicated by the number of varieties and grades of salt fish which are of commercial importance. Dealers and traders as well as consumers assess the quality of salt fish by means of touch and smell, a practice generally accepted in all parts of the country. No government regulation concerning quality or methods of assessing quality exists at the moment.

In *Pakistan*, systematic experiments have been done on the preservation of fish by sun

drying particularly with reference to the keeping quality of the dry fish. Attempts are being made to improve the existing methods of drying fish in the 'kholas' (fish curing yards) by way of practical demonstration.

2.2 Artificial Drying of Fisheries Products

In *Indonesia*, experiments have been carried out in drying of fish with an artificial dryer. The objective of these experiments is to find a method of drying fish independent of the weather condition, and which is simple enough to be applicable at any locality in the Archipelago. The result is a kiln dryer of the direct radiation type. Heat is provided by burning wood in a stove outside the drying chamber. The hot combustion products are conducted through a U-shaped heating pipe at the bottom of the chamber, where the heat is radiated, and escapes through a stack.

Previously salted fish has been successfully dried in the drier within 8-15 hours, depending on the size of the fish and the quantity dried at one time. The drying temperature is about 50°C with a relative humidity of 45% at the beginning and 30% at the end of the drying process.

In *Japan*, many types of driers tried in the past were usually unsuccessful in commercial use. However, new type of driers which were completed by several companies recently and have been mainly used for drying squid or other fish, have been found quite satisfactory. The reason of the success consists in the effective blowing or circulation of dry hot air at a lower temperature (usually below 30°C) than in the old method.

In addition, techniques using infra-red ray or freeze-drying methods are being tested at laboratory or pilot plant levels. The products made by these methods have excellent quality. But the initial and operational cost of the methods is still expensive for commercial use.

In *Korea*, a modern type mechanical drier has been installed.

In *Malaya*, the use of artificial driers in curing establishments is not practised. Curers depend on sun-and-wind for drying their products.

2.3 Packaging, Shipping and Storage of Cured Fish

In *Japan*, recently the use of cellophane or polyethylene sheet has been popular for wrapping the dried or similar products in *Japan*.

Cold storage is usually employed not only for fresh fish, but also for keeping and shipping of cured products such as dried fish or fish jelly products.

In *Malaya*, no standard form of packing is practised in any area. Containers of a variety of sizes and materials are used ranging from used wooden boxes, empty cigarette cartoons, split bamboo baskets, rattan and gunny sacks of jute or woven Pandan leaves. Generally, wooden boxes are lined with old newspapers, grease-proof paper or brown cartridge paper. The boxes are nailed and strengthened with steel tapes and stamped with the dealer's trade mark. These boxed products usually keep well from four to six months.

The storage life is often short and seldom lasts a fortnight if they are unpacked and exposed.

The Chinese salt fish traders in the major towns store their cured fish in cold rooms. This extends the storage life from six months to a year in many cases. The Fisheries Department is now conducting experiments and studying the chemical changes of cured fish under different temperature and humidity ranges.

Local salt fish traders and retailers do not observe rules of hygiene as regards insect infestation and very often decomposition is rapid. Sanitary laws concerning sale of these products need to be tightened up seriously in order to guard the health of the consumer as well as to help the industry.

2.4 Fermented Fisheries Products. These are described in IPFC Fisheries Products Manual. (IPFC/C61/WP 8).

In *Japan*, analyses of fermented fish products have been carried out and are shown in Tables below:

TABLE 1
Typical Analysis of Fermented Fish Products

No.*	Water	Protein	Fat	Ash	NaCl	Ca	P	Fe
	%	%	%	%	%	mg %	mg %	mg %
1	62.5	12.8	2.20	21.9	20.5	178	171	3.0
2	71.2	11.9	1.82	12.9	8.4	190	111	6.7
3	57.3	11.4	8.52	22.0	19.8	173	216	13.0
4	70.0	12.5	1.76	15.4	14.5	64	225	10.0
5	67.3	14.6	0.99	16.0	11.7	82	279	2.5
6	60.5	20.6	3.47	13.5	10.3	85	255	3.2
7	62.4	14.9	0.14	11.4	10.5	88	192	2.5
8	77.5	9.8	1.27	12.4	10.3	85	168	3.6
9	55.5	12.2	0.53	32.1	29.2	512	267	2.8
10	68.7	10.0	2.66	12.7	11.2	57	120	3.2
11	66.1	12.1	4.82	15.9	13.2	254	144	28.0
12	50.0	12.2	0.55	36.4	29.2	4200	258	1.7
13	38.3	31.4	6.39	9.4	7.0	48	493	4.2
14	58.4	16.0	0.34	9.9	8.0	143	192	4.0
15	65.5	14.8	8.52	6.7	5.4	20	300	3.0
16	34.6	7.2	2.91	7.8	6.7	88	285	20
17	53.9	25.1	9.95	9.2	7.3	50	462	3.6
18	23.1	39.9	29.10	6.4	4.2	56	375	6.0
19	56.0	19.1	1.77	22.2	20.5	113	327	5.7
20	64.0	29.1	0.60	8.3	6.4	50	477	1.5
21	51.0	20.1	7.30	7.3	4.8	100	592	4.4
22	60.8	20.2	0.14	18.5	18.1	49	135	7.2
23	66.0	16.4	0.49	16.5	15.4	41	252	4.4
24	40.9	41.0	1.17	16.2	15.1	71	274	2.5
25	60.0	20.4	0.44	5.6	3.5	67	168	3.2

* Commercial Name and Main Ingredients (p. 150).

TABLE 2
Ratio of Calcium and Phosphorus Contents

No.*	Ca	P	Ca/P	No.*	Ca	P	Ca/P
	mg %	mg %			mg %	mg %	
12	4200	258	16.25	3	173	216	0.80
9	512	267	1.92	14	143	192	0.75
11	254	144	1.76	19	113	327	0.35
2	190	111	1.71	21	100	592	0.17
1	178	171	1.04	7	88	192	0.46

* Commercial Name and Main Ingredients (p. 150).

TABLE 3
Contents of Vitamins

No.*	Vitamin A	Carotene	B ₂	B ₁₂	Pantothenic Acid	Folic Acid
	IU/100g	γ/100g	γ/g	γ/100g	γ/g	γ/100g
1	130	—	2.66	0.56	3.5	37.5
2	650	—	1.66	0.84	2.3	30.0
3	190	20	2.62	11.0	7.8	72.5
4	0	—	28.4	22.5	10.23	52.5
5	100	—	2.86	0.98	3.18	7.0
6	410	—	1.76	2.1	6.5	29.5
7	0	—	0.66	0.4	2.2	13.0
8	90	60	5.29	12.5	11.3	43.8
9	20	—	0.97	4.22	8.0	14.75
10	20	90	2.52	0.78	1.2	10.5
11	70	1800	7.33	12.5	5.03	30.0
12	10	40	4.98	0.66	2.72	25.0
13	50	1400	19.6	0.62	39.4	75.0
14	10	—	0.06	0.60	8.5	17.8
15	300	2500	3.68	1.60	1.8	147.0
16	0	1320	1.17	0.16	3.1	35.0
17	110	—	7.08	3.6	19.0	157.0
18	210	—	6.56	0.785	20.6	2.5
19	0	—	2.42	2.58	11.25	37.6
20	20	—	3.50	4.42	35.0	27.5
21	210	—	4.31	1.68	14.0	45.0
22	30	—	0.86	0.693	1.6	1.0
23	30	—	2.50	3.5	16.0	22.0
24	0	—	0.92	0.16	13.8	31.0
25	0	—	1.27	1.5	1.88	75.0

* Commercial Name and Main Ingredients (p. 150).

1. Katsuo shiokara ; Viscera of skipjack.
2. Syuto ; Viscera of skipjack.
3. Uruka ; Intestine and gonads of Ayu (*Plecoglossus altivelis*)
4. Mehun ; Kidney of salmon.
5. Ika shiokara ; Sliced flesh and liver of squid.
6. Ika kurozukuri ; Sliced squid with liver and sepia gland.
7. Ika kojizuke ; Sliced squid with rice malt.
8. Konowata ; Viscera of seacucumber.
9. Ami shiokara ; Mysis.
10. Awabi toshiro ; Viscera of abalone.
11. Ganzuke ; Crushed small crab with chilli.
12. Kanikotsuke ; Roe of crab.
13. Ebi kojizuke ; Small shrimp with rice malt.
14. Nagasaki uni ; Sea urchin roe.
15. Uni miso ; Sea urchin roe blended with bean paste.
16. Karasumi uni ; Mixed roe of sea urchin and mullet roe paste.
17. Karasumi ; Mullet roe paste pressed.
18. Tai no ko shiokara ; Sea bream roe.
19. Tarako ; Pollack roe.
20. Sujiko ; Salmon roe.
21. Kazunoko ; Herring roe.
22. Iri kinko ; Pollack roe fermented with spirit.
23. Fugu ibushi suji ; Glove fish fermented with rice malt.
24. Taira gai kasuzuki ; Scallop adductor muscle with rice wine-lees.

In *Thailand*, the production of fish sauce is the biggest fishery secondary industry in Thailand; anchovies and *Rastrelliger* are principally used as raw material. After salting, it will take about 10 to 12 months until ripening. The filtrate, a clear brown liquid, is used as a food ingredient. Production of fish sauce takes a

very long time, therefore it needs a big investment. Shrimp paste is another commonly used food ingredient in Thailand; mostly small shrimp (Plankton) are used as raw material. Because of the high price and scarcity of the raw material, the production is not enough for domestic requirements. Fish paste is produced mostly by salting and drying, thus the keeping quality of the product is very poor. There is no production of fermented sea fish in Thailand. The product is made from fresh-water fish and is popular and commonly used in the inland provinces. Experiments were undertaken to accelerate the process of manufacturing fish sauce. Also an experiment on filtering by the use of a modern filter was tried. Some practical tests were conducted in the laboratory with different raw materials, indicating that it was possible to make quite acceptable products from fish other than anchovies and *Rastrelliger*. The laboratory had started some work on the production of fermented fish from various cheap, raw marine materials.

3. FROZEN FISH

3.1 Techniques used for freezing

In *Ceylon*, very satisfactory results have attended the introduction of frozen local fish into the retail markets. This venture is carried out by the Ceylon Corporation Fish Sales Union, the freezing, cutting and packaging being done by the government Fish Factory at Colombo. Fish is frozen, cut into pieces of approximately one half pound, packed in polythene bags and the individual packets weighed and priced for sale by a large number of retail stores in the city of Colombo and a few in other parts of the island. Each store has a refrigerated cabinet for holding frozen fish. Cabinets are usually sold by the Union on hire purchase or else hired by the Union to the store. Most of the cabinets hold about 300 pounds of fish and stocks are replenished daily or as required. Out-station stores are supplied by a small fast van which at present is not even insulated. Frozen packets in wooden boxes have held well for about 3 to 4 hours.

The demand for these packets is so great that it now cannot be met and yet 3000 to 5000 pounds of packets are distributed daily. In an at-

tempt to reduce handling charges, in a few stores packets have been made available unpriced. In these stores the pricing is done when each packet is weighed at the time of sale on a balance which indicates the weight and price simultaneously on a specially designed indicator chart over which the scale needle moves.

Freezing however, despite the success of this scheme, is an additional cost and studies are being made into the possibility of introducing a similar scheme with wet cut fish on ice.

Lobsters have been frozen and exported on an experimental scale to the U.S.A. where the quality and pack were found satisfactory and accepted.

The popular methods of freezing in Korea appear to be shelf freezing with or without forced air circulation, air blast freezing, plate freezing (mainly used for shrimp) and to a smaller extent brine freezing which is mainly used for tuna. The temperatures used for freezing range from -18°C to -30°C . Two-stage compressors as being popularized in preference to single-stage machines to economize power consumption.

Production of frozen fishes—Korea is a peninsula surrounded by sea on three sides, and it is easy at any time or any where to get fresh fishes at moderate price, so the spread of frozen fish was delayed. As regards such fishes as mackerel and horse-mackerel which are caught in vast quantity in a short period, it is very difficult to control the fish price not depending on the freezing preservation method. The price of horse-mackerel was 2,500 Hwan per box (37 Kg) in August 1960, but at October 1960, it was 6,000 Hwan.

Recently it has become popular to freeze fishes in order to control the fish price, and on the other hand the freezing of dressed fishes such as fillet, steak or fish block has started for the purpose of sale to the U.S. Army in Korea.

3.2 Cold storage facilities

In Korea, the shrimp freezing industry had started when the Central Fisheries Experiment

Station exported 50 pounds of frozen shrimp to United States of America in 1957 on a trial basis. After that, it developed widely through the exploitation of shrimp resources, improvement of fishing method and cut-down of production cost.

The export of frozen shrimp for the United States of America in 1959 was about 102 metric tons. Also frozen shrimps have being delivered to the 8th U.S. Army and other foreign institutions in Korea.

In Korea shrimp is frozen generally into five pound blocks or peeled and frozen individually.

The shrimp species produced in Korea are *Penaeus japonicus*, *Penaeus orientalis*, *Penaopsis joyneri*, *Pandalus borealis*, etc.

4. DURABLE HIGH PROTEIN FOODS FROM FISH

In India, a new method has been developed for making fish flour for human consumption.

The method is as follows: minced fish flesh is fermented in the presence of defatted butter milk. The fermented fish flesh is subsequently treated in the same manner as in the conventional reduction process. The method is found to be particularly suited to Elasmobranch fishes where the body oil content is very low and the removal of the high flesh urea content presents a major problem. Fermentation is found to result in the almost complete removal of urea and partial deodorization. The extra cost involved in the fermentation is almost negligible. Further, the major disadvantages of the solvent extraction process, viz. high cost of production, toxic effect of traces of solvent remaining in the product, etc., are overcome in the fermentation process. Investigation on the keeping quality of the fish flour under ordinary conditions of storage showed that the products remain in very good condition for over 18 months. There is a certain amount of 'flavor reversion' during this period, but not enough to impart fish flavor to food preparations when quantities up to 15% by weight

of the flour are used. Percentages up to 20% by weight of fish flour prepared from shark and skate flesh by the fermentation process have been tried in food preparation without producing any fishy flavor.

In *Malaya*, the newly formed Malayan Marine Products Ltd. in Penang has brought out several grades of Tuna fish flour for human consumption as by-products at the Tuna canning factory. The Nutrition Division of the Institute of Medical Research has commented favourably on its nutritional value after analysis and has recommended its use to supplement the largely carbohydrate diet in this country.

In *Pakistan*, fish flour is a preserved fish in powder form. This contains a high percentage of protein and can be used as a protein supplement in daily diets. Systematic experiments have been undertaken in E. Pakistan to find a cheap and easy method for the preparation of fish flour on a commercial scale.

5. BY-PRODUCTS FROM FISH

5.1 Fish meal and solubles

In *India*, a fish meal plant was designed and constructed in the Central Marine Fisheries Research Station, Mandapam, to carry out pilot scale investigations. It permits preparation of fish meal by fermentation as well as by the conventional reduction methods. It is simple in design and has a capacity of holding 100 lb. of raw fish at a time, the entire assembly costing only about Rs. 500. One of the main considerations in the development of the plant has been to keep operational costs as low as possible so that the overall cost is within the reach of the common fishermen. The essential parts of the plant are a treatment chamber, a drying chamber and a heat source. The treatment chamber consists of an inner chamber and an outer drum. The treatment chamber is heated by a coal oven. A current of air from an air blower is allowed to pass through the lower portion of the oven to ensure a steady flame. A copper tube coil is fixed to the upper region of the coal oven which supplies hot air to the rotating chamber. The drying chamber and the air blower are connected with

ball bearings to a $\frac{1}{4}$ h.p. motor. The entire unit is assembled on a wooden platform, 7 ft. $\times$ 4 $\frac{1}{2}$ ft. The minced fish flesh is treated with defatted butter milk at pH of 4.5, mixed well and maintained at a temperature of 35°C. for about 2 hours; it is then heated for 15-30 min. in the inner chamber by steam generated in the outer chamber; when the flesh coagulates it is taken out by means of wire baskets; excess moisture is pressed out in a hand press leaving a press cake of moisture content of about 45 percent; the press cake is then transferred to the rotating dryer; steam is passed through the outer drum while hot air at 200°C. is directed into the inner drum; rate of flow of air is adjusted mechanically to the desired temperature; steam in the outer drum keeps the fish cake in a hot condition and facilitates speedy liberation of moisture from it. Trials indicate that the air temperatures between 150°C. and 200°C. are best suited for the production of quality fish meal. The maximum time taken for the conversion of the raw fish into dry powder is three hours. The fermentation period is found to be about 1 $\frac{1}{2}$ hr. in the case of shark. However, longer periods have been found advantageous in the case of other fishes.

Also in *India*, recently another type of small scale fish meal plant was developed by a fisheries engineer at Bombay. A demonstration of the plant was made in June 1959 at Bombay. The plant was designed and built by the fisheries engineer with the help of an expert on boilers, for the manufacture of fish meal from nonfood fish and fish waste. The demonstration was attended by the Bombay Director of Fisheries, members of the Bombay fish Meal Exporters Association, Japanese fisheries experts and local fishermen. Fish meal is exported and is a source of considerable foreign exchange to India. Fish meal has been manufactured locally by sun-drying the fish on concrete floors, which is a laborious process, requiring some two to three days to complete the process, depending on weather conditions. In additions, the final product contained a large amount of sand, and the protein content was never higher than 50 percent. This fish meal plant is the first of its kind in India and is built entirely to suit local conditions. It requires no power and it consists of a double-

jacketed dryer, a superheater, boiler and furnace, all built as one compact unit. The unique feature of this plant is that it can be operated on any fuel available, hence suitable for any part of the country, even when installed on fishing boats. The cost of operation is as low as Rs. 15 (about US\$ 3.15) per ton of fresh fish, and requires only one man to operate it. It is so built that it does not come under the regular Boiler Act, hence, it needs no registration. Each unit can handle some 5,000 lb. of raw fish per 24 hours, and the unit is expected to cost about Rs. 6,000 (about US\$ 1,270).

In *Indonesia*, at Kotabaru (Kalimantan), a small scale fish meal plant (5 tons of raw material/day) has been installed.

In *Japan*, the production of fish solubles has increased during the last few years. With the progress of the production, research are also performed on the nutritive value, components and application of the products.

Shigeo Murayama and Masaaki Yanase. Nutritive Elements of Fish Meal and Solubles Produced in Various Countries. *Bull. Tokai Reg. Fish Res. Lab.*, No 27, Feb. 1960, pp. 55-59.

Commercial fish meal and solubles produced in various countries have been assayed for their nutritive components with particular attention on the contents of vitamin groups, for which few reports have been made so far.

The contents of moisture, oil, protein and ash were determined by use of standard methods. Modifications of the A.O.A.C. methods (1950) were employed for determining inorganic substances; microbiological assay for vitamin B₆, pantothenic acid, folic acid and vitamin B₁₂; physical and chemical procedures for vitamin A, thiamine and riboflavin.

The results of the assays (presented in Table 1 and 2) seem to confirm the view that nutrient values of fish meal and the like vary, dependent on processing techniques as well as species of material fish, and that further studies should be encouraged for technological improvement including formulation of the recipe for a specific use.

Hideo Higashi, Shigene Takayama, Shigeo Murayama, Ichiro Hayashi, and Kenji Kanda. Utilization of Discarded Trawl Catches as Feed for Livestock. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 18, Oct. 1957, pp. 42-72.

According to the latest statistics, about 1,000,000 metric tons of fish are landed by trawl fisheries from the sea adjacent to Japan. In addition, great amounts fished by them are used for manure or discarded because they are not suitable for food.

With a view to utilizing these discarded catches, sampling surveys and laboratory assays have been conducted to determine their amount and species as well as their nutritive values such as proteins, fats, vitamins, and water contents. The results are :

1. The amount of discarded trawl catches excluding jelly fish is estimated to be about 37,500 tons a year on the basis of the data of 1954 and 1955. Roughly 55 per cent of this is fished in the coastal waters east of Long. 130° E., and the rest from the west of the longitude including the East China and Yellow Seas.
2. Although most of the discarded fish are small in size, they seem to be adult forms.
3. Vitamins and other nutritive contents of them are almost the same as in food fish.
4. For rational processing of the fish into feed for livestock, mixing the chopped meat with volatile preservatives or with antiputrefactive bacteria is recommended to be made soon after the hauling. Dehydration or mixing with wheat bran is suggested for making a better use of soluble parts of the fish.

In *Korea*, a pilot demonstration plant for fish meal and oil has been established at the Central Fisheries Experimental Station, Pusan. It has a capacity of 2 tons/day and a bigger plant is being built. The present situation is as follows :

The Present Condition—As the raw materials of fish meal, mackerel pike, hair-tail and *Collichthys fragilis*, which are cheap owing to big landing and the waste products of fishery processing plants, are utilized.

In the year 1937, when Korean fishermen enjoyed tremendous landings of sardines, the output of fish meal was 1,400,000 metric tons. Since the disappearance of sardines in 1941, there is a very limited fish meal production; and as the raw materials, at the present time, some cheap fishes and the wastes or by-product (head and entrails) of processing plants are utilized. The product is consumed as domestic animal food.

Summary of Manufacturing Method

Precooking—The raw material is pre-cooked to coagulate the protein, inactivate the enzymes and separate out the oil. The raw materials in wire-baskets are soaked in boiling water, then the temperature of water falls. Continuing heating, the water begins to boil again. The raw materials are boiled for ten to twenty minutes. The boiling water is reused with the addition of as much water as evaporated.

Pressing—The precooked raw-material is pressed to separate the moisture and oil. The "Kilin" type press is most widely used.

Drying—The pressed residue (so-called cake) contains 40 to 50 per cent of moisture. If the cake is left as it is it spoils. So the cake must be dried quickly, and it is usually crushed to facilitate the drying. In most of the fish meal plants, it is dried in the sun. It takes three or four days to dry the fish meal till the moisture content falls to about 10 per cent.

Pulverization—The dried cake are pulverized and becomes the final product. In Korea, the collision type pulverizer is used widely.

Yield and Chemical Composition of Fish Meal

The chemical composition of fish meal varies with the raw material, and even if the meal is manufactured from the same kind of fish, the

composition shows large variations with the season, the fishing ground where the fishes are caught, or the processing method. Among the chemical components, fat, calcium phosphate and sodium chloride show especially large variation. The more the fish meal contains crude fat and ash, the less is its nitrogen content. Fish-meal made by the boiling process has a lower nutritive-value than the fish meal made without boiling because some of the soluble substances are lost during boiling. The chemical composition of fish meal made of the fish waste from a canning factory is:

Moisture	10.50 - 13.16%
Crude fat	8.50 - 13.64%
Calcium phosphate	14.60 - 20.80%
Crude protein	38.80 - 44.37%
Ash	20.50 - 26.94%

The yield of the product also shows variation, but is generally 25 to 35%. The yield of fish oil shows the maximum at the spawning period and after this it decreases gradually. So, it is recommended to use the fishes caught in July through August when the fishes are mackerel or horse-mackerel.

Demand and Supply of Product

Regarding the present situation of demand and supply of fish meal, all of the fish meal is consumed as food in poultry farming and fish-breeding. During the period from November to April of each year there is a high demand for fish meal but not so much in other months. There are associations of animal food dealers in big cities, and associations of stock-breeders in towns and villages. These associations are the sole buyers of fish meal and they distribute it to the consumers.

Preservation and Packaging of Fish Meal

The fish meal is usually packaged in straw-sacks of 60 Kg net weight. The mixed food is packaged in hempen-sacks, paper boxes or wood boxes, and the contents are 45 Kg or 20 Kg.

The fish meal is stored as dried cake without crushing and is pulverized to the desired

mesh immediately before transportation because the meal is, if pulverized, subject to more oxidation and insect damage.

The Prospect and Problems to be Studied

Fish is the largest source of protein in the Korean diet, and its importance is emphasized by the lack in other protein-bearing foods in Korea, such as animal meats and vegetable protein sources. Fishes are also important as a potential source of foreign exchange with which other items necessary in the Korean economy may be paid for. However, it is very regrettable that many of the fishes caught are not utilized fully owing to the lack of adequate processing equipments.

The Central Fisheries Experiment Station has planned to demonstrate the full utilization of cheap fish and the wastes of processing plants such as the head and entrails, aiming to control the fish prices and assist in operating the processing plants most effectively. Some problems under study are as follows.

- A. Utilization of miscellaneous fish.
 - a. White meal
 - b. Seasoned fish meal
 - c. Animal food.
- B. Products made of star-fish.
 - a. Animal food
 - b. Insecticide.
- C. Utilization of boiled-juice and pressed-juice.
 - a. Sauce made of fish boiled-juice.
- D. Utilization of waste from processing plants.
 - a. Extracted fish juice
 - b. Seasoning agent
 - c. Animal food
 - d. Fertilizer.

In *Pakistan*, fish wastes and waste fishes are collected from different fish curing centres of the East Pakistan Province and these are converted into fish meal and fish manure. Fish

manure is a good soil fertilizer and fish meal is an excellent feed for the poultry. These products are sold to the Directorates of Agriculture and Live Stock Services.

Fish scales contain a high percentage of Gelatin. This gelatin can be extracted from the scales and can be treated to prepare a high class adhesive. The residual matter can be used for producing soil fertilizer. *Pakistan* is producing fish glue every year and selling it in the local markets. Much improvement has been made on the quality of the glue.

5.2 Fish oils

In *Pakistan*, it has been found that fish oil after polymerisation by heating can be used as substitute for Linseed oil in making Printers' Ink, paint and varnish. A formula for preparing Printers' Ink from fish oil has been devised and good quality ink is being produced and sold in the market.

Some samples of lubricants for precision machinery and liniment for rheumatism have been prepared from porpoise body and jaw oil. Experiments are in progress in this line.

5.3 Fish liver oils

In *Indonesia*, simple methods of processing fish liver oil have been investigated, using shark livers (*Scoliodon jordani*) as a sample.

The methods tried out are: dripping, steaming and extraction with petroleum ether. The resulting oil has a sufficiently high quality, and the methods are being developed for propagation to the fishermen.

In *Japan*, the production of concentrated vitamin oil by the use of falling film molecular still is being popularized. Recently, researches on the centrifugal molecular have been started.

The highest potency vitamin A concentrate by the saponification method has been manufactured by several companies. They are also producing vitamin A palmitate of million units per gr. and crystalline vitamin A acetate. Improvements of the extraction method of vitamin

oil from fish livers have been performed on a laboratory or industrial scale. The improved methods are the digestion by the use of enzyme instead of alkali; the extraction with solvent for the effective use of the residue; and the use of vegetable oils as pick up oil in order to obtain better results in further concentration.

During 1959/60, fish liver oil and vitamin A extraction were studied in Japan and a summary of some of the published papers is given below:

Hideo Higashi, Yaichiro Shimma and Hisako Taguchi. Study on Alkali Digestion for Producing Vitamin Oil from Fish Livers. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 26, Nov. 1959, pp. 75-87.

In producing vitamin oil from fish livers with a high oil content, alkali digestion has been efficiently applied on an industrial scale. When the liver oil contents are low as in some species of fish, however, considerable difficulties would be encountered in separating the oil from other components of the emulsion, resulting in failure to extract vitamin A. With a view to overcoming the difficulties, the digestion method has been studied by dividing the work into four essential steps: pretreatment, alkali digestion, picking-up process, and separation of the vitamin oil. The livers used for the study have been obtained from fin whale, bluefin tuna, yellowfin tuna, skipjack and shark.

1) Pretreatment: When livers of low oil contents were directly subjected to the alkali digestion, part of the vitamin could not be extracted. Therefore, prior to the digestion, the livers, minced and diluted with an equal amount of water, were constantly stirred in the presence of a 0.4-2% commercial protease for 70 minutes at a temperature of 45-50°C. The vitamin yield from the whale liver was improved by this treatment. Other suspensions, which were treated with weak alkali (pH about 9.0) under the same conditions as the enzymatic digestion, showed appreciable yields.

2) Alkali digestion: After the pretreatment, NaOH was added to liquefy the liver tissues satisfactorily. As the suspensions usually

showed pH 6.0-6.5, a proportion of alkali was needed for neutralizing them before dissolving the material with the rest. The digestion was continued for 20 minutes at a temperature of 80°C. In reference to the vitamin yields obtained, the optimal amount of alkali for processing the low oil livers is 5-6%.

3) Picking-up process: After liquefying the suspension, the remaining excess alkali was neutralized by acid, the pH value being adjusted to about 9.0. A pick-up oil (8-10%) was added and mixed with the solution as much as possible by stirring, usually for 30 minutes. In ordinary practices, the pick-up oil is added before or during the alkali digesting process. However, it has been found that addition of the pick-up oil after the digestion and adjustment of pH gives better results in the vitamin yields as well as the oil recovery.

4) Separation of the vitamin oil: Diluted usually with an equal volume of water, the liquefied suspension was kept in a boiling bath for 30 minutes. Then the vitamin oil was separated and came up to the surface. Especially in this step of the alkali digestion method, pH value in the digested solution seems to exert an important influence upon the yield.

Hideo Higashi, Takeshige Yamakawa and Yushiro Shimoda. Studies on the Vitamin Oil Extraction—I. Loss of Vitamin A in the Alkali Digestion Method. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 26, Nov. 1959, pp. 69-73.

In extracting vitamin oil by the usual alkali digestion method, the loss of vitamin A flowing into the digesting waste is thought to be considerable. The present work was carried out to investigate the extent of the loss of vitamin A, which has not been known yet, on semi-industrial scale by alkali digestion method. The materials used were liver oil of albacore, or mixed ones from bigeyed tuna and bluefin.

The result indicated that the loss of vitamin A in the usual alkali digestion was unexpectedly high. However, when protease was used along with alkali as a means of improvement, a better result was obtained particularly in case of a solid tissue of liver.

Hideo Higashi, Takeshige Yamakawa and Naoki Maita. Studies on the Extraction of Vitamin Oil—II. Comparative Effect of Soy Bean Oil and Pollack Liver Oil as the Pick-up Oil. *Bull. Tokai Reg. Fish. Res. Lab.*, No. 27, Feb. 1960, pp. 41-46.

The authors examined the efficiency of molecular distillation, yields and potencies of the vitamin oil by using soy bean oil and pollack liver oil as the pick-up oil in the alkali digestion method. The results obtained are as follows.

In the extraction of vitamin oil from fish liver oil, the use of soy bean oil did not bring any remarkable effect. But in the later stages of treatment, for instance, molecular distillation or concentration, it gave a better result in yield or ratio of concentration of vitamin A. Also, stability of the distillates in the case of soy bean oil was good.

Yaichior Shimma and Minoru Tanaka. Studies on the Economical Manufacture of Vitamin A Concentrate from Fish Liver Oil—VIII. Chromatographical Separation of Vitamin Concentrates. *Bull. Jap. Soc. Sci. Fish.*, Vol. 25, No. 1, 1959, pp. 52-58.

One of a series, this report is concerned with the chromatographical analysis of vitamin concentrate. The purpose of the chromatography is to clarify the nature of the concentrate and obtain the data necessary for the further concentration. The following are the outlines of the experiment.

I) Vitamin concentrates obtained by the saponification method were divided into three fractions by the use of chromatographical technique. The qualities and the contents of non-vitamin substances in the fractions were examined.

A chromatographic column was used. As adsorbents, Merk's alumina weakened by 3.3% methanol is used. Dissolve 0.3 gr. of unsaponifiable matter in light petroleum to pass through the column and then elute by different solvents into the following three fractions.

Fraction I is developed with light petroleum to make the total volume of solvent 50 ml. It contains anhydrovitamin A and other hydrocarbons.

Fraction II is developed with benzene containing 5% methanol, to make the total volume of solvent 50 ml, and contains vitamins, sterols, and other mono-, and dihydric-alcohols.

Fraction III is the residue remaining in the column.

II) Maleic anhydride reacts rapidly on conjugated double bonds in vitamin A and other compounds in unsaponifiable matter. Samples of concentrates were treated with maleic anhydride in benzene for six hours on a boiling water bath. After saponified, unsaponifiable matter was extracted with ether. The extracts having no conjugated double bonds, were also divided into three fractions by the chromatographical method mentioned above.

After comparing the result with that of original concentrates, the weight percent diagrams of vitamin concentrates were obtained.

III) The same chromatographical analysis was applied to each molecular distillate of vitamin concentrate. From the result, it was ascertained that molecular distillation was very useful to refine the concentrate and to remove non-vitamin materials having conjugated double bonds. But the method is not applicable to removing compounds with no conjugated double bonds, for the distillate contains the compounds as much as original concentrate.

Hideo Higashi, Takeshige Yamakawa, Tokugoro Kaneko and Kisaburo Sugii. Studies on the Economical Manufacture of Vitamin A concentrate from Fish Liver Oil—IX. Purification of Vitamin A Concentrate with Methanol. *Bull. Jap. Soc. Sci. Fish.*, Vol. 25, No. 1, 1959, pp. 59-66.

In succession to the previous experiments on this subject, technological improvement has been sought to concentrate vitamin A to a higher level and free it from odor. In the present work

a method for treating vitamin A concentrate with aqueous methanol under specific conditions has been successful in eliminating the fishy smell as well as hydrocarbon from the product. The color of the refined substance was found to be improved to some extent.

Therefore, the method may be recommended as an approach to industrially refining vitamin A concentrate at a reduced cost. The following are the procedures of and the results from the experiments.

1) Different amounts and strengths of methanol were added to each sample of vitamin A concentrate. The mixture was boiled until a solution was formed. After cooling over-night, the separated methanol-soluble fraction was decanted and evaporated. Vitamin A was concentrated in this fraction, while vitamin D was in the fraction insoluble in methanol.

2) Of the various procedures compared as to the refining efficiency, the most effective was found to be a twice-repeating treatment (method A) with 90% methanol 20 times as much as the vitamin A sample—the second treatment extracting the vitamin A from the residue of the first extract.

3) In determining the effect of the vitamin A material from different species of fish, a method was compared with method B in which petroleum ether solution was extracted with methanol. Although the results were somewhat variable depending on the samples, the recovery of the vitamin A concentrate was greater in method A than in B, while the rate of concentration was *vice versa*.

4) The methanol soluble fraction obtained by both methods was subjected to chromatographic determination with a view to separating the material into three fractions as it was chromatographed in the alumina column. Upon measuring the weights and vitamin A levels of the eluted fractions it was revealed that the component impurities to be eliminated were variable even in the same procedure depending on the species of fish used for the vitamin A sample.

5) Vitamin D was separated at a high level in the methanol insoluble fraction. It is suggested, therefore, that the method with some improvement may be adopted for separating the liver oil of some species into vitamin A and vitamin D.

Hideo Higashi, Tokugoro Kaneko, Kisaburo Sugii, Takeshige Yamakawa and Shigeo Iseki. Studies on the Economical Manufacture of Vitamin A Concentrate from Fish Liver Oil—X. Adsorption by Weakened Acid Clay. *Bull. Jap. Soc. Sci. Fish.*, Vol. 25, No. 3, 1959, pp. 196-203.

In the usual methods for refining a vitamin A concentrate (hereinafter referred to as the sample), vitamin A is more or less liable to be destroyed as it is subjected first to adsorption to separate impurities and then to elution before obtaining a higher concentrate.

In a search for technological improvement it occurred to the authors that acid clay, when weakened appropriately, could be economically used as an adsorbent of impurities so as to avert the destruction of vitamin A.

In the experiments a definite amount of aqueous solution of ammonia, urea or NaOH was added to acid clay. The mixture was dried, pulverised, and then heated at a certain temperature. The acid clay thus weakened was used as the material adsorbing impurities from the sample.

Two methods were employed in adsorbing impurities of the sample into the weakened acid clay; one was a normal column chromatography and the other was shaking or stirring.

The results of the experiments were as follows:

1) Under certain conditions, it has been possible to concentrate vitamin A by the use of acid clay weakened with ammonia or urea. Nevertheless, further experiments proved that a constant activity could not be secured in these adsorbents.

2) When weakened with NaOH, however, acid clay showed a constant activity in removing a part of the impurities from the sample together

with fishyness and dark color. The best result was obtained when the weakened acid clay containing 3.5% NaOH was heated at 150°C and used at the rate of 20 parts to 1 part of the sample. Along with this adsorbent the shaking or stirring method is recommended to be most economical and practical for industrial purposes.

3) With a view to examining the refining efficiency, the compositions of the sample before and after carrying out the adsorption were determined on the basis of alumina chromatographic fractionation, and the results were compared. The weakened acid clay was capable of adsorbing entirely fraction III consisting only of the impurities. In fraction II which consisted of the impurities and vitamin A, both equally adsorbable to alumina, a greater part of the former was adsorbed by the weakened acid clay.

4) Kanuma earth (a kind of clay used in gardening) weakened by KOH was also as effective as the NaOH weakened acid clay in adsorbing impurities.

The present condition with regard to fish liver oil in Korea is as follows:

The resources of fish liver oil, in Korea, are the livers of shark and pollack. The chief producing district of pollack is the east coast sea of Korea and the pollack liver oil is manufactured during the period from October to May of next year.

The chief producing district of shark is the east and south coast sea, and the shark liver oil is manufactured the whole year round. The shark liver oil is, at present, manufactured exclusively by the Korean Pelagic Longline Fishermen's Association.

There are two shark liver oil plants and 46 plants which make the pollack liver oil and viscera-oil of cuttle-fish and mackerel-pike, and the total production capacity is 18,650 D/M per year. The fish liver oil manufactured at these plants has been exported to the foreign countries as crude oil. A large-scale liver oil concentrating and refining factory is being constructed and when the installation is completed it will be able to produce 700 metric tons of refined liver

oil. There are a few whale oil plants in which the equipment is too old and decrepit to operate smoothly.

Summary of Processing Methods

The pollack liver oil produced in Korea usually shows 4,000 to 12,000 U.S.P. unit of vitamin-A content, shark liver oil, 5,000 to 24,000 unit. In Korea, liver oil is made by comparatively simple methods such as boiling process and pressing process but shark or pollack liver oils, are sometimes manufactured by alkali-process.

Roasting method—This method is applicable when the oil content of the liver is high. The liver is put into the batch and heated until the oil are extracted. The upper layer oil is scooped out by ladle and the residue is pressed.

Direct-fire boiling method—This method is used in the manufacturing of pollack liver oil. The liver together with water is put into the batch and heated to boiling for 20 to 30 minutes, by direct-fire. The next process after this is the same as the abovementioned method.

Steam boiling method—This method is an advance on the afore-said method. The raw materials are heated with steam directly, or indirectly in a steam-jacketed kettle.

Alkali-method—The liver is cut into small pieces and the alkali-solution that contains about three per cent of sodium hydroxide to the weight of liver is added to the liver. When this mixture is heated the liver tissue decomposes. The oil and residue are separated by centrifuge.

Packaging

Fish liver oil produced in Korea is exported to Japan and United States of America. The oil is filled in iron drums, the capacity of which is 50 to 65 gallons, and sealed for storage or shipping.

The Prospect and Problems to be Solved

Study on the extracting method of vitamin-A from the liver of whale, mackerel and other fishes

The liver of whale and mackerel contains much vitamin-A but because the oil content of

liver of these fishes is very poor, it is very difficult to extract liver oils by the ordinary methods.

Efforts are being made to establish a means of perfect utilization of those vitamin-A resources by the development of a new extracting method.

Investigation of liver oil resource and study on the improvement of oil manufacturing method

The liver oil industry of Korea is showing more and more activity and is devoted to earning foreign exchange. As yet Korea does not utilize fully the resources of vitamin-A in cuttle-fish, pollack and other fishes which are landed in vast quantity at the east and south coast sea.

By encouraging the scientific research of liver oil resource and developing more effective extracting method, an increase of liver oil production, and in consequence the earning of more foreign exchange is expected.

In *Pakistan*, the Technology Section of the Directorate of Fisheries East Pakistan has been producing medicinal shark liver oil containing vitamin 'A' for human consumption and also for animal nutrition. In producing this nutritional oil some commercial fish oils are also obtained as a by-product which is sold in the market for commercial uses such as soap making and for tanning leather. The crude shark liver oil is collected from Cox's Bazar, Dubla Island and the processing and refinement of the oil are done in the Laboratory. Every year this nutritional oil is being supplied to the Health Directorate and to the Directorate of Live Stock.

Experiments have been conducted to find out a suitable easier and cheap method of refinement of shark liver oil. Recently a new method for refinement of shark liver oil which is very easy to adopt has been investigated. By this process the oil becomes almost colourless, odourless and remains crystal clear even at a very low temperature. Attempts are being made patent the process.

Experiments are being made to prepare emulsion with shark liver oil like similar foreign

products. Shark liver oil which contains vitamin A has a disagreeable fishy odour. If shark liver oil is given in an emulsion from which this fishy odour is eliminated without any loss of the vitamin, the product becomes palatable.

Preparation of vitamin 'A' concentrates from shark liver oil:

Attempts are being made to prepare high potency oil from low potency oil by different chemical methods. High potency oil in the form of concentrates may be given in the form of tablets and capsules. The advantage of such concentrates lies chiefly in the smaller doses required with consequent ease in administration.

6. CANNED FISH

In *India*, a small shrimp cannery was started in late 1959 in the small fishing village of Malpe, South India. The equipment was designed and manufactured locally and packs about 3,000 cans per 8 hr./day. A somewhat larger shrimp cannery, located in Cochin, South India, started operations in September 1958 and has a rated capacity of 12,000 cans/day. Both the canneries together have a capacity of nearly 2 millions cans a year valued at Rs. 3 million (US\$628,000), and the product is exported mainly to U.S.A.

In *Indonesia*, a pilot cannery for canning tuna has been set up in Ambon (Moluccas) and is being extended.

In *Japan*, there are more than 75 factories producing canned tuna and most of them are situated in the Shizuoka Prefecture, mainly in Yaizu and Shimizu. The procedure employed in a typical tuna cannery in Japan is as follows: Raw material is generally frozen longfin tuna though other species of tuna are also used. One typical factory which handles 22 to 25 tons of raw tuna per day employs 180 people. The frozen tuna are thawed in a water tank for a day which also removes blood. The head, viscera, etc. are removed and the body is trimmed into a block the same shape as that for preparation of Kat-suobushi (rough triangle). The trimmings are collected, cleaned and used separately. The tuna blocks are then cut into steaks by machine and

packed by hand in 2 kg. round cans. The loins are separated and small amounts put into each can to improve the flavor. 1% salt and water are put into the can, and the cans are vacuum sealed and processed at about 232°F or 8 lb./sq. in. pressure for 2½ hours. The trimmings are separately canned in 250 g. cans in soya sauce, and are processed for 1½ hours at 7 lb./sq. in. pressure. About 3½ million cases of canned tuna (48 cans/case) are exported from Japan, about 80% going to U.S.A. and the rest to Canada and Europe.

In *Korea*, there are 39 fish canneries with a total capacity of 400 million cases per year. The products canned are mainly boiled fish, mackerel, horse mackerel, spanish mackerel, mackerel pike, saury, etc., in brine or in Korean sauce. Also fish balls or a Kamaboko type product is also canned. The fish are brined in 12° to 13° Be brine for 30 min., filled in 1 lb. cans, steamed for 30 min. at 6 lb./sq. in. pressure, sealed under 15 inches of vacuum and processed for 90 min. at 8 lb./sq. in. The process is practically the same in all the canneries. The markets for canned fish are limited to the armed forces.

Ten additional Korean tuna fishing vessels were expected to fish for the American Samoa tuna cannery in 1960. One Korean tuna vessel began fishing for the canner during 1958/59 (reports from other sources state that first Korean vessel arrived early in 1958) and two more Korean vessels arrived later in 1959. The American Samoan Government has decided to place two Samoan fishermen aboard each of the Korean vessels for training.

In the *Federation of Malaya*, a Malayan-Japanese tuna fishing company operates four tuna boats to supply fish to a tuna cannery in Penang. The fish are caught in the Indian Ocean and on an average 200 tons of frozen fish are landed monthly. The fish caught consist mainly of Yellowfin tuna, bigeye tuna, albacore and marlin. Marlin forms about 30% of the catch and as this fish cannot be canned for the European market and as also there is no market for marlin in Malaya, there exists a problem for the disposal of this fish. The cannery is situated in Penang and packs about 4 tons of tuna per day in 7 oz. cans in refined soya or cotton seed oil.

The product is almost wholly exported to Europe. There is a cold store attached to the cannery, having a capacity of more than 200 tons.

Canning of fish in this country is a very recent enterprise and only Tunas are being canned for export, as home consumption so far has been discouraging and negligible.

The only vegetable oils used at the moment for Tuna by the canning factory are Soya-bean and cotton-seed oils.

In *Thailand*, the canning industry compared with other fish-processing industries is quite small. Most of the canneries are located in or near Bangkok, at considerable distances from the fishing ground. With the exception of a few progressive firms, both the technical and hygienic standards of the canning industry are extremely low. Some of the plants even lack equipment for proper sterilization of their products. Selection and procurement of tinplate or ready-made cans to suit the various products present a serious problem for the plants. The fish cake production in Thailand is rather big, but most of the plants are rather unhygienic, and there is no mechanical equipment used for the preparation of the product. The canning methods are studied at the Fisheries Technological Laboratory. The laboratory has canned several products successfully, using tuna, bonito, *Rastrelliger* and ark-shell as raw material.

7. BOILED FISH

Boiling as a means of preserving fish for short or long periods under tropical conditions is practised in Cambodia, India, Indonesia, Japan, Korea, Philippines, Thailand and Vietnam. A draft report on this product has been prepared and circularized to members of the Technical Committee II, Panel B. The Report forms Section I in the IPFC Fisheries Products Manual (IPFC/C 61/WP 8).

8. SEAWEED PRODUCTS

Small quantities of dried seaweed have been exported commercially from *Ceylon* in 1960. There is a possibility of this export increasing in the future. Each consignment has been sampled

and reported on by the algologist of the Department of Fisheries before export, at the request of the exporter.

In Japan, bidding for 1960 crop of *Gelidium* or agar-agar seaweed began in June 1960 at various Japanese producing areas. In some places the price was very high. The raw seaweed for agar-agar is commanding higher prices because of the decline in production and the increase in demand in 1959.

In 1959, the *Gelidium* crop was poor, with production on the Muroto coast of Kochi Prefecture down by 50 percent, and for the country as a whole down about 20 percent. *Gracilaria* production was only about one-sixth of normal in the main producing area of Akkeshi Bay, and for the country as a whole it was down about 35 percent. For several years the average annual production has been about 11,578,000 pounds of *Gelidium* and about 8,270,000 pounds of other agar-producing seaweeds. On the other hand, the demand is considered to be about 16,540,000 pounds of *Gelidium* and about 9,097,000 pounds of other kinds of seaweed.

The difference is made up by imports from other countries. Until 1958 imports were about 2.5 to 3.3 million pounds, but last year imports jumped to 6.6 million pounds. Prior to 1958, imports were all from Korea, but last year seaweed was bought from countries all over the world.

At Hachioji, the Japan Seaweed Industry Corporation has built a large factory in 1959. The company's production plans are said to call for

making 1.2 million pounds of agar-agar from *Gelidium* and 300,000 pounds from *Gracilaria*. Calculated in terms of raw seaweed, this is nearly 5 million pounds of *Gelidium* and 840,500 pounds of *Gracilaria*.

It is expected from present indications that the national production of seaweeds in 1960 will be 10 to 20 percent above 1959. However, demand has grown more than this.

In Korea, the manufacturing of agar-agar on a commercial scale was started in 1910. Now agar-agar is one of the more important Korean marine products. The production has increased each year since the beginning and in 1953 and 1954 the production reached 750,000 pounds per year.

Though since 1955 the production has decreased gradually, it is increasing again from 1959, and the production in 1960 is expected to be over 700,000 pounds.

There are 40 agar-agar factories in Korea, but only 23 factories are operating. Recently three scientific agar-agar factories have been established and are operating successfully.

Packaging

As export pack, 100 pounds of agar-agar are pressed into a cube and wrapped with moisture-proof paper and gunny, then bound with an iron belt.

Inspection

The agar-agar for export must be inspected by the inspectors of Central Fisheries Inspection Station. The inspection standards are as follows:

	Color and luster	Form and symmetry	Jelly strength	Pigment	Insoluble substance
Full marks	100	30	60	10	10
Special grade	Over 95	Over	(Over 400 g/cm ²)	Over 9	Over 9
1st grade	94-80	27-25	51-47 (390-350)	8	8
2nd grade	79-60	24-20	46-34 (340-250)	7-6	7-6
3rd grade	59-40	19-15	33-21 (240-160)	5-4	5-4
Rejected	Under 39	Under 14	20 (Under 150)	Under 3	Under 3

9. RESEARCH ACTIVITIES

9.1 Research Institutions

In India, Japan, Korea, Philippines and Thailand, there exist research institutions which are exclusively meant for carrying out research in the various aspects of fish processing technology. In many other countries e.g. Federation of Malaya, Vietnam, Pakistan, research laboratories and facilities exist for conducting investigations on fish processing and preservation.

The Government of *India* has established a Central Fisheries Technological Research Station which is engaged in investigations relating to fish processing. The present programme includes work relating to the frozen prawn industry, canning of prawns, salt curing, pickling of fish and fish-meal production. This Station is also engaged in working out standards for the various fish and fisheries products with a view eventually to develop quality control.

9.2 Research Programs

State of Research in Fish Processing Technology

In *Ceylon*, studies are being conducted on the weight changes that accompany the freezing and storage of the different varieties of fish in the course of normal transactions and on the possibility of freezing and storing the difficult kinds such as shark for sale as packeted frozen fish.

The total number of the papers presented in *Japan* in 1958 is 365. Biochemical studies cover about half of the papers respectively. About one third of the total appeared in the *Bulletin of the Japanese Society of Scientific Fisheries*, and about one sixth in the periodicals of the fisheries research laboratories and experimental stations. Work done in various universities occupy another one sixth of the total. The rest were contributed to many other journals such as *J. Chem. Soc. Jap.*, *J. Agr. Chem. Soc.*, *J. Jap. Biochem. Soc.* etc.

Among the biochemical studies, more than half are related to the organic chemistry of the components of aquatic animals and plants. In this field, studies on protein and fat are dominant. This fact is reasonable, for the work deals mainly

with fish. But the characteristic feature during the last year is that many were performed on the muscle protein. Another remarkable aspect in 1958 is that natural pigments have attracted much attention of workers in contrast with only one or two papers hitherto published on this subject a year. This phenomenon is in line with the latest tendency where the prevention of discoloration or fading of fisheries products is becoming important in *Japan*. The most notable feature in physiological and medical chemistry is that many works on poison and poisoning were carried out in 1958.

Among technological studies, those on spoilage were the largest in number. It was due to the fact that in *Japan* as elsewhere the preservation of fish and fisheries products is one of the most essential problems in this field. It will also be noticed that the application of antibiotics to the prevention of spoilage has started in *Japan*. In conclusion it may be said that the work done on the various fisheries products, for instance, to improve the quality or to introduce a new method of manufacture etc., were concentrated on the commercially important products in *Japan*. This tendency will be seen in the Table which indicates the amount of marine products and the number of related papers prepared in *Japan*. However, attention should be drawn to a few exceptional cases. For example, the quantity of seaweed listed in the Table may not show a true situation with regard to the seaweed industry, because no information is available on the amount of seaweed material used for producing alginic acid, while a number of papers on this subject appeared in journals of industrial chemistry. The amount of effort put in so far in regard to refrigeration and fish offals for farm use has been relatively insignificant in spite of considerable quantity of production in these items. In the case of refrigeration emphasis has been placed on mechanical engineering which is excluded from the tabulation. In the case of animal food and manure, there are difficulties in carrying out coordinated experiments on marine material for agricultural purposes. In this connection further cooperation should be encouraged between research institutions in fishery and agricultural fields in *Japan*.

*Number of papers on marine products technology
and related subject presented in 1958.*

Subject	Kinds of periodical				Total
	A	B	C	D	
I. Biochemical study	<u>75</u>	<u>17</u>	<u>45</u>	<u>59</u>	<u>196</u>
1. Chemical components	<u>46</u>	<u>13</u>	<u>24</u>	<u>32</u>	<u>115</u>
a. General	5	1		1	7
b. Proteins and amino acid	5	1		6	29
Muscle protein (Myosin)	9	1	1	1	
Analytical methods	1		4	5	
c. Lipids	2		10	10	26
Analytical methods		3		1	
d. Enzymes	2		2	1	11
Determination of enzyme	4		1	1	
e. Vitamins					
General	1	1		2	19
Vitamin A		2		1	
„ B ₂		1		2	
„ B ₆		1		1	
„ B ₁₂	2			1	
Other Vitamins	3		1	4	
f. Natural pigments	7	1	4	1	13
g. Natural fluorescents		1			1
h. Components of seaweed	5		1	3	9
2. Physical chemistry and chemical reaction	<u>19</u>	<u>1</u>	<u>9</u>	<u>10</u>	<u>39</u>
a. Proteins and amino acids	13	1	4	1	19
b. Lipids				1	3
Oxidation and peroxide			1	1	
c. Enzymes	6		4	7	17
3. Physiological and medical chemistry	<u>10</u>	<u>3</u>	<u>12</u>	<u>17</u>	<u>42</u>
a. General	3		2	1	6
b. Lipids			2		2
c. Seaweed components		2	2	5	9
d. Radio isotopes	4		1		5
e. Natural poison and toxicity	1			6	7
f. Poisoning		1	5	2	8
g. Odor	2			3	5

A. Bull. Jap. Soc. Sci. Fish.

B. Periodicals of Regional Fisheries Research Laboratories belonging to the Central Government and Prefectural Fisheries Experimental Station. Fisheries Experimental Stations.

C. Periodicals of various universities.

D. Other periodicals.

Underlined numbers indicate the total of the numbers of subordinate items that follow.

Subject	Kinds of periodicals				Total
	A	B	C	D	
II. Technological study	<u>44</u>	<u>33</u>	<u>38</u>	<u>56</u>	<u>169</u>
1. Spoilage	<u>24</u>	<u>18</u>	<u>15</u>	<u>1</u>	<u>58</u>
a. Chemical changes during spoilage	8	7	3		18
b. Prevention of spoilage, antibiotics	7	1	1	9	18
Other antiseptics		2	6	8	
Preservation by irradiation				1	
c. Bacteriological study	6	7	3		16
d. Determination of spoilage	3	1	2		6
2. Discoloration by rancidity				<u>1</u>	<u>1</u>
3. Change of colour	<u>5</u>	<u>2</u>		<u>4</u>	<u>11</u>
a. Blue meat	3				11
b. Prevention of fading and discoloration	2	2		4	
4. Quality determination of products		<u>2</u>	<u>2</u>	<u>4</u>	<u>8</u>
5. Dried products and drying	1	5	3		9
6. Salted products and salting	1	2	1	1	5
7. Cold storage	1		4		5
8. Smoked products and smoking			1		1
9. Fish jelly products (<i>Neriseihin</i>) and their productive methods	5	4	1		10
10. Fish solubles			2		2
11. Canning			2	16	18
12. Fat technology	4	1	1		6
13. Alginic acid				25	25
14. Agar-agar	3		5	1	9
15. Miscellaneous			<u>1</u>	<u>3</u>	<u>4</u>
a. Fish leather			1		4
b. Pearl				1	
c. Utilization of marine water				2	

A. Bull. Jap. Soc. Sci. Fish.

B. Periodicals of Regional Fisheries Research Laboratories belonging to the Central Government and Prefectural Fisheries Experimental Station. Fisheries Experimental Stations.

C. Periodicals of various universities.

D. Other periodicals.

Underlined numbers indicate the total of the numbers of subordinate items that follow.

*Amount of processed marine commodities
in reference to the number of relevant papers.*

Type of product	Amount in 1957 Unit: 10,000 metric tons	Number of papers in 1958
Dried product	36.0	9
Salted product	7.9	5
Frozen product	37.4	5
Smoked product	0.2	1
Fish jelly product (<i>Neriseihin</i>)	43.4	10
Animal food and manure	15.7	2
Canned product	44.0	18
Fish oil	3.6	6
Seaweed product	6.3	36*
Miscellaneous	14.6	Not applicable

* Includes 25 for alginic acid and 9 for agar-agar.

Particularly, attention should be given to progress in such items as:

1. Denaturation of protein of fish meat and its application for such purposes as preservation of fish products, and improvement of curing and freeze-drying techniques.
2. Pigments of fish muscle and skin.
3. Phosphatide of fish.
4. Various aspects of fish soluble.
5. Components of vitamin oil. Especially on the cis-isomers of vitamin A contained in liver oil.

In *Korea*, the list of research reports published by the Processing and Food Technology Section of the Central Fisheries Experiment Station is as follows:

1. Biochemical studies of the big shark caught at Korean coast. (1st and 2nd report, 1952)
2. Studies on the antiseptic effect of Furasukin (Nitro-furazone) on fresh fish and processed fisheries products, 1953.
3. Studies on the body components and ecological state of mackerel, 1953.

4. On the utilization of unused seaweeds as the cohesive of anthracite balls, 1953.
5. Report on the boiled oyster canning, 1953.
6. On the vitamin-A content of liver oil of shark which was caught at the near sea of Pusan, Korea, 1954.
7. Report on the trial make of field rations, 1954.
8. The survey of fisheries literature (Canning Part), 1954.
9. Report on the canning of smoked oyster in oil, 1954.
10. Experiment on the chemical preservatives of fisheries food, 1954.
11. On the manufacturing of fish sauce with the juice of salt-cured fishes, 1954.
12. Investigations on the scientific agar-agar industry. (No. 1 and 2), 1955.
13. On the high utilization of seaweeds, (No. 1 and 2) 1955, 1956.
14. Biochemistry and processing of marine foods, 1955.
15. Some studies on the emulsion stratum of oil, 1955.

16. Experiment on the separation of oil and water, 1955.
17. Report on the molecular distillation apparatus of liver oil, 1955.
18. The story of whale, 1955.
19. The Annual Report of Central Fisheries Experiment Station, Vol. 1, 1955.
 - a. Investigation on the manufacturing of the large-size cans.
 - b. On the chemical composition of the incomplete protein and its physical significance and utilization of extract of principal Korean marine animal, (Part 1 and 2).
 - c. The variation of the constitution of the incomplete protein in the muscle extract of flat-fish and sea eel according to the time passed after death.
 - d. Studies on the seasonal changes of the glycogen in the oyster, (Part 1).
20. The Annual Report of Central Fisheries Experiment Station, Vol. 2, 1956.
 - a. Studies on the manufacturing of pickled oyster.
 - b. The utilization of *Ceramium rubrum* as raw material of agar-agar.
 - c. The survey of analytical data regarding to the important marine animal and seaweed.
 - d. The seasonal variation of component of oyster.
 - e. Studies on the seasonal changes of glycogen in the oyster, (Part 2).
 - f. Studies on the transportation of live oyster.
 - g. Investigation on the capacity of refrigeration pilot plant of Central Fisheries Experiment Station.
 - h. Studies on the composition of the incomplete protein and its physiological significance and utilization of meat extract of principal Korean marine animals.
 - i. The variation in the constitution of the incomplete protein in the muscle

extract of *Tilapia* and leach according to the degree of fatigue.

- j. Studies on the bleaching powders used in the manufacturing of agar-agar.
- k. Investigation on the manufacturing of sheet (film) agar-agar and powder agar-agar by cataphoresis process.

The list of reports under publication.

1. Studies on the chemical changes of oyster and shrimp occurred during cold storage.
2. Experiment on increasing the yield of agar-agar.
3. Studies on the quality of salt and freshness of the raw fish which affect the quality of salted fish.
4. Biochemical researches of the important fisheries resources.

The outline of projects of Processing and Food-Technology Section, Central Fisheries Experiment Station in 1960.

1. Demonstrations on keeping the freshness of catches.
 - a. Bacteriological and biochemical studies on the septic bacteria of fishes.
 - b. Arranging the test panel system of judge the quality of fresh and cooked fishes.
 - c. Chilling and handling method of fishery catches.
 - d. The sterilization and improvement of fish holds and boxes (size, form, content, material, etc.).
 - e. Potential application of antibiotics in keeping the freshness of fish.
 - f. Studies on the transportation and distribution of fishes.
2. Fish curing demonstration project.
 - a. Promoting the quality and exploiting the foreign and domestic market of dried and salted fish.
 - b. Quality control and market development of pickled product and smoked product.

3. Demonstration projects on the freezing and cold-storage.
 - a. Promoting the quality of frozen fishery product and exploiting the foreign and domestic market for the product.
 - b. Improvement of freezing facilities and cold-storage warehouses.
 - c. Fundamental experiments on the changes of frozen fishes during cold storage.
4. The improvement of processing methods and exploiting the resources of fish liver oil and fish meal.
 - a. Improvement of processing method and exploiting the resources of fish liver oil.
 - b. Studies on manufacturing fish meal and fish oil with miscellaneous fishes and fish wastes.
 - c. On the molecular distillation of fish liver oil.
5. Demonstration projects on the agar-agar *Gelidium amansii* process.
 - a. The utilization of miscellaneous seaweeds in lieu of *Gelidium amansii*.
 - b. On the removal of impurities of agar-agar.
 - c. Prevention of spoilage of *Gelidium* jelly.
6. Fish canning demonstration.
 - a. Promoting the quality of tin can.
 - b. Canning of exportable fish and exploiting the foreign markets.
7. Training course for processing technician.
 - a. Fish handling.
 - b. Fish curing.
 - c. Freezing and cold storage.
 - d. Canning.
 - e. Fish liver oil.
 - f. Agar-agar.

8. Biochemical researches of important marine resource.

9. Investigation on the utilization of fishery wastes. (1) fish sauce, (2) fish scale, (3) fish paste.

In *Malaya*, research into methods of processing, suitability of raw materials, packaging and storage conditions have never been done in the past on any serious scale. Spasmodic attempts and experiments on canning methods and preparation of fish meal have been carried out, but the results obtained have not been applied to the fish curing industry as yet.

Most cured products are dependent on the agencies of sun and wind and there is far too much handling of the products at various stages of preparation. The resulting product which is in a state of advanced decomposition imparts a flavour which is much relished by the local population. Storage conditions for cured products are quite inadequate and very often they do not keep for more than a fortnight under the humid conditions.

The Fisheries Department is therefore attempting to provide ways and means for more efficient storage methods to help the fish curing industry at the moment particularly for salted fish. In order to prolong the keeping quality and storage life of salted fish work was begun in October, 1959 to study the preservation of such cured products in cold rooms and determining the rate of decomposition by the Total Volatile Nitrogenous bases given off during storage. Samples of cured fish were stored at different temperature and humidity ranges. Preliminary observations have shown that the keeping quality of salted fish can be extended to a period of ten to twelve months under reduced temperatures.

No attempts at research into other cured products have been instituted, largely due to lack of trained personnel. It is the intention of the department to undertake serious research into the cured-fish technology during the next year.

In *Philippines*, the annual report of the Technological Research Section of the Dagatdagatan Fisheries Research Laboratory, for 1959-60 gives the following information :

Technological Research Section has planned the following research projects which will redound to the upliftment of the fish processing business and the fishing industry as a whole :

1. The effect of Sorbistat on the keeping quality of dried fishery products.
2. The effect of calamansi juice on the preservation and keeping quality of fresh shrimps.
3. Studies on the storage and keeping quality of fish scrap meals.
4. Comparative quality determination of different commercial brands of patis.
5. Studies on the percentage yield of bagoong and patis from different species of fish.
6. Standardization of recipes from canned galonggong (roundscad), salmon style.
7. Research on the standardization of canned Philippine fishery products.
8. The utilization of various species of fish in the manufacture of fish sausage.
9. Studies on the keeping quality of fish sausage.
10. Studies on the fermentation of fish paste (bagoong).
11. Utilization of seaweeds and algae in the preparation of fish meal for animal and human consumption.
12. Determination of the vitamin content of fish liver oil found in Philippine market fishes.
13. Studies on the effect of acids in the extraction of agar from *Garcillaria confervoides*.
14. Studies on the effect of potassium sorbate (sorbistat) on the keeping quality of smoked Philippine fishes.
15. The efficacy of some preservatives on the preservation of abaca and maguey fishing twines.
16. Improvement of methods used in the preservation of trepang.
17. Studies on the extraction of hydrolyzed protein from various Philippine market fishes.

18. Changes that take place in the bangos from time of catch up to a twelve-hour period.

Operations :

The implementation of the research activities of the Section was made possible by a staff which is composed of the following personnel :

Supervising Fishery Technologist	1
Senior Fishery Technologist	4
Fishery Technologist	2
Junior Fishery Technologist	4
Fishery Demonstrator	1
Laboratory Aide, Fishery Aide,	
Mechanic I and Senior Stenographer . .	5
Total . . .	<u>17</u>

Accomplishments :

Projects completed :

1. *The effect of sorbistat on the keeping quality of dried fishery products.* Sorbistat is a brand of sorbic acid which is an effective non-toxic and practical fungicidal agent for foods. It is metabolized, so it is capable of preventing the growth of molds in dried fishery products (herring) for five months.
2. *The effect of calamansi juice on the preservation and keeping quality of fresh shrimps.* The experiment conducted showed that "Calamansi juice" lowers the bacterial count because of its ability to lower the pH. It inhibits the action of enzymes tyrosinase which cause blackening of shrimps. It helps in the maintenance of the protein content of shrimps and prevents the development of early deteriorative changes in color and texture and development of odors.
3. *Studies on the storage and keeping quality of fish scrap meals.* This includes the determination of moisture, fat and protein content of the product which is the basis of its utilization for long periods of experimentation. With its

nutritive value still retained, the fish meal can be utilized for emergency purposes as long as storage does not reduce the quality of the samples.

4. *Comparative quality determination of different commercial brands of patis.* This is a comparative study of the chemical analysis of the popular brands of patis in the market today with the aim of appraising their inherent qualities for the benefit of the consumers.
5. *Studies on the percentage yield of bagoong and patis from different species of fish.* This study attempts to get the average yield of bagoong and patis respectively from common raw materials like herring, roundscad (galonggong), dilis, etc. By knowing the yield of the raw materials to be used, we can make a sound prospectus of a "bagoong" or "patis" plant.
6. *Standardization of recipes from canned galonggong (roundscad), salmon style.* The study on the utilization of canned galonggong, will be a basis in the different recipe preparations being tested. The standardized recipes which will be distributed to the public, especially to the rural areas, will boost the utilization of locally canned galonggong.
7. *Research on the standardization of canned Philippine fishery products.* The main object of this project is to standardize the procedure and quality of canned fish products that can be locally produced like bangos, herring, roundscads and tuna.
8. *The utilization of various species of fish in the manufacture of fish sausage.* This experiment deals with the utilization of cheap species of fish like kalasok sharks, etc. in the manufacture of fish sausages.
9. *Studies on the keeping quality of fish sausage.* This is an experiment on the keeping quality of fish sausage using furasukin. Fish sausage is highly

perishable and can easily be attacked by molds without any preservative. It is believed that furasukin, as a preservative, will lengthen the keeping quality of fish sausage.

Researches in progress :

1. *Studies on the fermentation of fish paste (bagoong).* The aim behind this study is to shorten the fermentation period of salted fish (bagoong) by the gradual addition of salt to the raw material until such a time when the definite proportion of salt is totally added to the fish being fermented.
2. *Utilization of seaweeds in the preparation of fish meal for animal and human consumption.* This study is being undertaken to determine whether *Gracillaria confervoides* and other species of seaweeds can be incorporated into fish meal to increase its nutritive value and fit for consumption both to human beings and animals.
3. *Determination of the vitamin content of fish liver oil found in Philippine market fishes.* This study aims to investigate the potential vitamin contents and nutritive values of fish liver oils.
4. *Studies on the effect of acids in the extraction of agar from *Gracillaria confervoides*.* This study attempts to get a better yield of agar from seaweeds as well as to improve the quality through the use of acids. Promising results are evident in the use of sulfuric acid in the extraction of agar from *Gracillaria confervoides*.
5. *Studies on the effect of potassium sorbate (sorbistat) on the keeping quality of smoked Philippine fishes.* This study aims to investigate the effectiveness of sorbistat in lengthening the storage quality of smoked fish.
6. *The efficacy of some preservatives on the preservation of abaca and maguey fishing twines.* This experiment attempts to investigate the efficacy of various net

preservatives in relation to durability to abrasions and attack of microorganisms in fishing twines.

7. *Improvement of methods used in the preservation of trepang.* Realizing the economic value of trepang, studies are being made on the improvement of preservation and utilization of the trepang.
8. *Studies on the extraction of hydrolized protein from the flesh of various Philippine market fishes.* The main purpose is to be able to make a rich protein concentrate which is important in the dietary requirements of persons who have hypertension and convalescing patients.
9. *Change that take place in the bangos from the time of catch up to a twelve-hour period.* This is a combination of organoleptic observation and chemical analysis of bangos to detect spoilage changes at a certain interval of time immediately after catch.

10. DOCUMENTATION

During the inter-session period between the 8th and 9th Session, the following documents were circulated to the members of the committee.

10.1 Boiled Fish

The Council during its 8th Session held in Colombo, Ceylon, December 6-22, 1958 recognized that boiling of fish in water may afford a simple method of preserving fish for short periods under tropical conditions, and recommended that a comprehensive report on this product should be prepared. Information on boiled fish has been received from Australia, Ceylon, India, Indonesia, Japan, Korea, Federation of Malaya, Pakistan, Philippines, Thailand, Singapore, U.S.A. and Vietnam. The information contributed by the Panel members as well as information available in the IPFC library were incorporated in a draft Report on Boiled Fish which was circulated to Member Governments during March 1960. The

Report on Boiled Fish forms Section 1 in the IPFC Fisheries Products Manual (Ref: IPFC/C61/WP 8).

10.2 Fisheries Products Manual

As a result of a number of circulars that has been sent to members of the Technical Committee II, Panel B, requesting material for the IPFC Fisheries Products Manual, the following countries supplied information on the fish processing practices in their countries: Ceylon, Japan, Korea, Federation of Malaya, Pakistan, Philippines, Thailand and Hong Kong. This information together with other information available in various scientific publications and Government Reports has been compiled into the first draft of the Fisheries Products Manual (Ref: IPFC/C61/WP 8).

10.3 Dried Fish and Shark Liver Oil

During its 29th Meeting held at Hong Kong, the IPFC Executive Committee directed the Secretariat to obtain further information on the details of the techniques developed in Pakistan for the preparation of dried fish and for the incorporation of Vitamins from shark liver oil into vegetable oils. The above information was received from Pakistan and has been circularized to Member Governments.

11. TRAINING CENTRES

A Regional Training Centre in Fish Processing Technology (with particular reference to Curing in the Humid Tropics) is being planned to be held in Manila during 6 March-15 April 1961. The prospectus of the Training Centre is given in IPFC/C61/WP 3.

12. PERSONNEL OF THE FAO REGIONAL OFFICE FOR ASIA AND THE FAR EAST

Concerning the Regional Consultant in Fish Processing and Preservation, Bangkok, who was requested during the 7th and 8th Sessions, no action has been taken pending the holding of the Training Centre on Fish Processing Technology at Quezon City, Philippines, during 6 March-15 April 1960.

Part B

*The Council's Review of the Inter-session Report
and recommendations arising therefrom*

- I. ICING AND FREEZING OF FISH
- II. DISTRIBUTION OF FISH
- III. FISH CURING AND DRYING
- IV. FERMENTED FISHERIES PRODUCTS
- V. FISH MEAL AND FLOUR
- VI. PLANKTON AS FOOD
- VII. FISH LIVER OIL
- VIII. CANNED FISH
- IX. RESEARCH
- X. DOCUMENTATION

INTRODUCTION

The Council reviewed the inter-session report and agreed that it gives a most comprehensive picture of the fish processing industry in the Region. The Council noted with satisfaction that a number of recommendations made at its earlier Sessions have been carried out by Member Governments as well as by FAO.

ICING AND FREEZING OF FISH

The Council noted that in the handling, storage and distribution of fresh fish, the use of ice has increased but the prices of ice as supplied to the fishermen in the different countries vary widely. The Council decided to urge Member Governments to provide facilities for supply of ice to fishermen at reasonable prices.

An interesting statement was made by the Delegate of Korea on the use of flake-ice machines. Flake-ice appears to be preferred by the fishermen in Korea. The Council noted that in many countries of the Indo-Pacific Region, block ice is transported over long distances from the ice factory to small fishing villages for icing fish which has to be sent back to urban markets. This practice increases the price of ice and the Council recommended that Member Governments might study the feasibility of setting up

small flake-ice plants in fishing villages which normally depend on ice factories in distant bigger towns for their ice supply.

The Council noted that one of the factors responsible for the high price of ice in many areas of the Indo-Pacific Region, is the rapid melting of the ice due to high ambient temperatures. Development of cheap insulating materials for insulating fish boxes, fish holds, insulated or refrigerated trucks and cars, is necessary and the Council felt that research should be undertaken to study the feasibility of developing cheap insulating materials from locally available raw materials.

In many countries of the Indo-Pacific Region, it has been found necessary to instal small ice plants to meet local requirements for ice. The Council asked FAO to obtain data on the smallest "economic unit" that could be installed in small fishing villages.

The Council reviewed the frozen fish industry in the Region and noted that frozen fish has overcome consumer resistance in many countries of the Region. The problem of seasonal surpluses exists in many countries and due to lack of facilities for treating the glut in catches, a considerable portion of the catch goes to waste. The Council felt that in view of the high cost of canning containers, freezing and cold storage would provide practical alternative method of handling seasonal gluts. The Council considered that a survey of the fish freezing and cold storage costs would be a helpful guide to Member Governments in their consideration of providing increased freezing and cold storage facilities to deal with seasonal gluts and decided to ask FAO to prepare a comprehensive report on fish freezing and cold storage costs and economical size of freezing plants and cold storage chambers.

DISTRIBUTION OF FISH

The Council reviewed the fresh fish distribution facilities available in the Indo-Pacific

Region and suggested that where feasible, small insulated containers for transport of fresh fish in ice should be developed.

Much interest was expressed in the statement that, in the Philippines, air transport of fresh fish to outlying areas is cheaper than transport by road, rail or water. The Council urged Member Governments to study the possibility of using this method of transport where feasible. It was also recommended that special reduced cargo rates for sending fresh or frozen fish by air should be levied and the airlines requested to examine the possibilities of offering special reduced rates.

The Council discussed the problem of containers for handling, transport and distribution of fresh fish and recognized that two aspects should be considered: the containers for short distance and containers for long distance transport. These should be economical in cost and the latter should have more insulating properties than the former. The use of aluminium fish boxes in Australia was noted but the Council was of the view that aluminium fish boxes are not practicable from the economic point of view in most countries of the Indo-Pacific Region. The improvement of traditionally used wooden fish boxes, bamboo baskets, etc., appear to be more immediately practicable. The Council noted that painting of fish boxes, use of round cane baskets rather than split bamboo baskets, with stainless steel wire fastenings increased the durability of these containers but the economic aspects of these improvements are not yet known.

The Council also noted with interest that in Korea because of shortage in the supply of lumber for fish boxes, many newly constructed fishing boats have fish holds divided into compartments like "Pigeon holes", for the purpose of saving on fish boxes as well as for storage of ice. These compartments have proved efficient in keeping the freshness of fish while being transported on sea.

In view of the importance of fish containers, the Council decided to ask FAO to make a study of the containers used for fresh fish handling, transport and distribution by issuing a

questionnaire to Member Governments on this subject. The Council also urged Member Governments to cooperate with FAO in the collection of information pertaining to fish containers used in their countries.

The Council reviewed the present situation in regard to transport of fish and urged Member Governments to provide increased facilities for transport and distribution of fish, such as special freight rates, and making available insulated or refrigerated trucks, cars and insulated containers.

FISH CURING AND DRYING

In regard to fish curing, the Council noted that the Regional Training Centre on Fish Processing Technology is to be held in Quezon City, Philippines, during 6 March - April 1961. The prospectus of the Training Centre was examined and found to be satisfactory.

The Council noted that the quality of salt used for curing fish leaves much to be desired and urged on Member Governments to ensure that good quality salt, with low calcium and magnesium impurities, are supplied to the fish curers at reasonable prices.

The deterioration of salted dried fish during storage due to infestation by molds and also by rancidity is a problem in the Indo-Pacific Region. The Council noted with interest the researches carried out in this field in Philippines and Japan and suggested to Member Governments that they should consider the possibility of using commercially available food antioxidants and fungistats to combat this problem.

The Council noted that researches carried out in Japan and elsewhere have indicated that fish spread out on the ground for drying tends to attract more flies than fish spread on racks high above the ground and decided to ask Member Governments to advise the fish curers to improve the hygienic conditions by using racks for drying of fish.

After noting that the use of mechanical driers has not made much headway in the Region, the Council agreed that while sundrying

would still be the most economical method, particularly in the tropical areas of the region, the use of mechanical driers should be considered particularly where there is wastage of fish caused by rains, high humidity and other unfavourable weather conditions. In this connection, the Council also noted that the Training Centre on Fish Processing with particular reference to fish curing in humid tropics, which was requested by the Council in its 8th Session, is to be held during 6 March-15 April 1961 at Quezon City, the Philippines. The Council also emphasized that the development of an economical mechanical drier which would perhaps also utilize solar energy for purposes of heating air would be of great assistance to the member countries and urged FAO to study the feasibility of development of such driers. The Council also urged FAO to make a detailed study of the economics of the different fish drying processes including mechanical vs. sundrying under tropical conditions and prepare a comprehensive report on this subject.

FERMENTED FISHERIES PRODUCTS

Recognising that the fermented fisheries products industry in the Region is a food processing industry of major importance, the Council noted that the production techniques involve long periods of maceration of fish and the quality of the products varies considerably. The Council was of the opinion that there is room for considerable improvements in the process of manufacture, particularly shortening the time of maceration, as well as standardization of the quality and felt that researches should be directed towards improving and shortening of traditional methods. The Council also noted that fermented fisheries products is an important topic which is to be discussed at the forthcoming FAO Training Centre in Fish Processing.

It was stated that in Vietnam fermented fish sauce has been successfully spray-dried into a powder form and also condensed to a fourth of its original volume by evaporation at low temperatures without impairing the flavour of the product. The Council was convinced that the

production of fermented fish sauce in a powdered or condensed form would greatly reduce the container, bulk transport and distribution problems and felt it its duty to bring this development to the attention of Member Governments.

FISH MEAL AND FLOUR

With regard to fish flour and fish meal, it was noted that there has been a phenomenal increase in the world capacity for production of fish meal during the past few years resulting in fall in prices, and that an emergency FAO International Meeting on Fish Meal is to be held in Rome during March this year. Noting that the Meeting is to discuss in addition to the other topics, use of surplus fish meal for human and animal feeding, the Council reiterated its observation made during the 8th Session held at Colombo during December 1958, that fish flour (deodorised, decolorized, and defatted fish meal) does not seem to have any significant possibilities in this Region at present. The Council, however, heard with interest, a statement that a type of fish meal (ruoc-bong-ca) made from sun-dried fresh fish is widely used as human food in Vietnam.

PLANKTON AS FOOD

Concerning the use of planktonic organisms as food, the Council, noted with great interest that shrimp meal (made from small Mysid shrimps) or flour has been used in Vietnam on an experimental basis as animal food to make up for shortage of fish meal and that fermented pastes made from these animals are widely used in many parts of the Region for human consumption. The Council wishes to bring to the attention of those Member Governments where the use of planktonic organisms for human food is unknown, the mode of use of these organisms for human consumption in the other areas of this Region, in order to assist them in their consideration for development of suitable recipes from plankton for human food in their own countries.

FISH LIVER OIL

A review of the fish liver oil industry in the Region indicated that in addition to shark

livers, skate livers and livers from tuna and related species offer possibilities of extraction of medicinal liver oil.

CANNED FISH

After reiterating the observations made at the 8th Session, that canned fish has an extremely limited market at present in the Region the Council urged Member Governments to consider the possibilities of packing many tropical varieties of fish and developing an export market for canned fish. In view of the high cost of packaging material the Council felt that it is its duty to bring to the attention of Member Governments that exemption of import duty and sales tax, etc., on tin-plate would considerably facilitate export of canned fish to more developed countries.

RESEARCH

After noting that there has been an expansion of research activities in the field of fish processing technology in the Region, the Council felt its duty to remind Member Governments that adequate funds should be provided for research. The Council also urged Member Governments that research staff, where appropriate should be given facilities for advanced training for long-enough periods and in this connection brought to the attention of Member Governments, the existence of several National and International aid-giving Agencies.

DOCUMENTATION

Boiled Fish

The Council considered the report on boiled fish which forms Section I in the Fisheries Products Manual and agreed that it is most comprehensive. In view of the possible importance

of this method of fish preservation not only in this Region but also in other under-developed Regions of the world, the Council asked FAO to publish Section I of the Fisheries Products Manual on boiled fish also as a separate reprint and make it available to Member Governments at an earlier date.

Seaweeds

The Council expressed great interest in the Fisheries Products Manual, Section 7 (WP 8), on utilization of seaweeds as human food and also in the technical papers Nos. 11 and 24 concerning the use of seaweeds. The Council felt that the information contained in Section 7 of the Fisheries Products Manual (WP 8) would be of great importance to Member Governments in their consideration of extension of the use of seaweeds as human food in their countries and asked FAO to publish Section 7 of the Fisheries Products Manual also as a separate reprint for wider distribution.

Fisheries Products Manual

The Council reviewed the first draft of the Fisheries Products Manual (WP 8) and agreed that it is the most comprehensive factual survey of the fish processing techniques of the Indo-Pacific Region and decided to ask FAO to have this document published as soon as possible.

Great interest was expressed in the various fisheries products the processing of which were described in the Fisheries Products Manual (WP 8) and the Council strongly endorsed the suggestion made by the delegate from Vietnam that at the next Session of the Council, Member Governments should be asked to send samples of typical fisheries products from their countries for exhibition purposes.

CHAPTER V

SOCIO-ECONOMICS, STATISTICS & MARKETING

Part A

*Report of the Inter-session Activities of Technical Committee II, Panel C, and
Fish Marketing Sub-Committee*

CONTENTS

1. SOCIO-ECONOMICS	176
1.1 Government Credit Schemes	176
1.2 Financial Status of Fishermen	196
2. FISH MARKETING	205
2.1 Government Fish Marketing Activities	205
2.2 Fish Transport	219
2.3 Personnel and Training Facilities	230

1. SOCIO-ECONOMICS

1.1 Government Credit Schemes for Fishery Industries in the Indo-Pacific Region

I. INTRODUCTION

II. LENDING AGENCIES

III. BUDGETARY PROVISIONS

IV. PURPOSES FOR WHICH CREDIT IS EXTENDED

V. PROCEDURES FOLLOWED IN THE ADMINISTRATION OF SCHEMES

(i) Criteria applied, and procedures followed, in the selection of beneficiaries and requirements for the provision of security in loan agreements.

(ii) Terms on which loans are extended and repayment provisions

(a) Proportion of total amount required by borrower represented by loan

(b) Interest rates charged

(c) Repayment provision

VI. REVIEW OF OPERATION OF SCHEMES

I. INTRODUCTION

This report has been prepared on the basis of answers received to a questionnaire on Government Credit Facilities for Fishery Industries distributed to Member Countries in the Indo-Pacific Region and arising from recommendation adopted at the Seventh and Eighth Sessions of the Indo-Pacific Fisheries Council which requested the FAO's assistance in conducting a survey, giving special consideration to "present forms of credit, rates of interest or return, the forms and extent of security required as well as the effectiveness of existing credit facilities".

Information was received from most of the countries in the Region, and has been supplemented by information gathered from other sources.

Since the survey on which this paper is based was confined to government facilities, the information presented here does not furnish a complete picture of fishery credit operations in the Region. In some countries, cooperative facilities, commercial banking institutions, and non-institutional lenders are of substantial importance as suppliers of credit.

II. LENDING AGENCIES

In most countries of the region, government agencies participate directly in the administration of fishery loan programs. The agencies concerned usually are those responsible for fisheries and, in the case of loans to cooperative associations, departments established to further cooperative development. Formal authority to approve loans, as a rule, is vested with the chief officer of the executive agency, and the funds in most instances are made available directly by the agency. In some instances, though—e.g. in the case of credit extended to fishermen's cooperative by the Department of Cooperative Development of the Federation of Malaya—loans are channeled through a specialized lending institution which has responsibility for the operational aspects of the loan program.

In **Australia**, both the Commonwealth and the State Governments participate in the distribution of public credit to fisheries.

At the federal level, the *Fisheries Development Trust Account*, administered directly by the Minister for Primary Industry, was established in 1956.

At the State level, in *New South Wales* the Chief Secretary is empowered to extend loans from a special marketing fund administered by him. Under another statute, the State Government guarantees loans of specified types extended to fishermen's cooperatives.

Queensland: the Fish Board, a special instrument serving the interests of the fishery industries, makes advances to fishermen for specified purposes. The loans are to supplement rather than replace loans available from financial institutions.

South Australia: loan funds are extended by the *State Bank*, a central banking institution.

Tasmania: credit assistance is administered by a specialized government institution, the *Agricultural Bank of Tasmania*.

Victoria: the *Rural Finance Corporation*, a Government-sponsored agency, provides assistance when it cannot be obtained through other channels.

Western Australia: financial assistance is being provided through the *Division of Industrial Finance*, a government agency.

Burma: a distinction is being made in the provision of loan assistance between individual fishermen and cooperative associations. Credit to fishermen is administered by the Fisheries Division of the *Agriculture and Rural Development Corporation*, a specialized institution; cooperatives are assisted by a government agency, the Fishery Cooperative Division of the *Cooperative Department*.

Ceylon: the *Department of Fisheries* issues loans both to individual fishermen and cooperative associations. On loan applications by cooperative associations, it is advised by the *Department of Cooperative Development*. Both Departments are government agencies.

Hong Kong: *The Government of Hong Kong* has established a revolving loan fund known as the Fisheries Development Loan Fund for the building and maintenance of distant and midwater fishing vessels. *The Cooperative Development and Fisheries Department*, a government agency which is also responsible for the administration of the Fish Marketing Organization, extends loans for the purchase and installation of diesel engines and/or winches only. *The Fish Marketing Organization* (F.M.O.), a special institution serving the interest of the fishing industries, extends loans for a large variety of productive purposes. Loans are made for pond fish culture from the *Kadoorie Agricultural Aid Loan Fund* and the *J.E. Joseph Trust Fund* through the Agriculture and Forestry Department and the Co-operative Development and Fisheries Department respectively.

India: the bulk of public loan capital is provided by the *Ministry of Food and Agriculture* of the *Central Government*. The two programs presently in existence are administered by the *Ministry's Fisheries Division* and the *Grow More Food Section* respectively. Supplementary funds are made available by the *State Fisheries Departments* and the *State Cooperative Departments*.

Indonesia: a number of agencies participate in the distribution of public loan funds to

fishery industries, among these two government departments: the *Central Sea Fisheries Service* and the *Central Cooperative Service*; the *Farmers' and Fishermen's Bank*; the *Indonesia People's Bank*; the *Government Pawn Service*, and the *Institute for Credit Guarantee*.

Japan: The specialized institutions serving the fishery industries are: the *Agriculture, Forestry and Fisheries Financing Corporation*, the *Japan Development Bank*, the *People's Finance Corporation*, the *Hokkaido and Tohoku Districts Development Corporation*, and the *Finance Cooperation for Smaller Enterprises*.

Federation of Malaya: the fisheries credit program is administered by the *Department of Cooperative Development*. (Loan to fishermen's co-operatives and their members are extended through the *Rural Cooperative Apex Bank*.)

Pakistan: the *Central Fisheries Department* of the Government makes available fishing equipment under a hire-purchase arrangement. The *Pakistan Industrial Finance Corporation and Agriculture Bank* advances credit for processing and marketing operations.

Philippines: the two specialized credit industries institutions which extend loans to fisheries apart from the *Philippine National Bank* are the *Development Bank of the Philippines* and the *Agricultural Credit and Cooperative Financing Administration (ACCFA)*, the latter serving the needs of cooperative associations.

Thailand: the authority administering the fisheries loan program is the *Department of Fisheries* (Ministry of Agriculture).

U.S.A. (State of Hawaii): The *Fisheries Loan Fund*, established by the Fish and Wildlife Act of 1956, authorizes the *Secretary of the Interior* of the United States to approve loans to owners of fishing vessels and fishing gear and to persons doing research into the basic problems of the fisheries. Loans are administered through the *Office of Loans and Grants*. For all loans over \$10,000 the credit investigation is done by the *Small Business Administration*. If the loan is for under \$10,000 the credit investigation is made by the representative of the *Office of Loans and*

Grants. The *Small Business Administration* also make loans to state and local development companies to help them provide facilities and financing for small business concerns in their areas. The *Small Business Administration* handles loans either in cooperation with banks or other private lending institutions or by itself, depending on the type of loan.

III. BUDGETARY PROVISIONS

Public loan funds for fishery industries may be provided in a number of ways. A basic distinction can be made between funds provided from general revenue, funds apportioned from specific sources of income, and funds raised by special levies. The choice, thus, is between allocating certain sums under the budget of the agency administering fisheries for loan purposes, setting aside funds or certain portions of income from specified taxes—e.g. taxes on motor oil—or establishing a special levy for the express purpose of accumulating capital to be made available for loan purposes.

From the standpoint of budgetary procedures there are several methods of allocating funds. Some countries make lump sum appropriations for specified objectives. The moneys thus allocated may be distributed as outright grants or subsidies, or advanced in the form of loans. Where loan capital is appropriated on a lump sum basis, it is presumed that when such funds are exhausted either new capital will be provided, or that the objectives for which the funds were established have been accomplished and that consequently no further moneys are required.

Revolving funds differ from the above insofar as the money collected through repayment of loan capital and interest can be used for the extension of additional loans, the original capital made available for loan purposes as a result going that much further. Under revolving fund arrangements, a time period is usually specified after which funds appropriated must revert to the treasury.

Rather than making a one-time lump sum provision, the government may prefer to appropriate funds on an annual basis.

In some instances, government administered loan funds are financed by moneys received from abroad in the form of loans, gifts or counterpart funds.

Special credit and banking institutions set up to administer credit funds for fisheries and other industries are financed in a variety of ways, with loan funds being derived most frequently from capital contributed both by the government and the beneficiary industries.

Details on the derivation of funds used for loan purposes are not available for all Government lending agencies in the Indo-Pacific region. Such information as has been obtained on this aspect is given below :

Australia: periodic allocations are made for specific projects from the Fisheries Development Trust Account established at the federal level. The Trust Account funds appropriated from general revenue are to total eventually a sum of approximately £A 750,000.

New South Wales: loan capital is derived from the profits of the fish marketing fund which was established by the State government.

No details are available regarding the financing of loan operations by the Fish Board in *Queensland*, the State Bank in *South Australia*, the Agricultural Bank in *Tasmania*, the Rural Finance Corporation in *Victoria*, or the Division of Industrial Finance in *Western Australia*.

Burma: loan funds made available by the Cooperative Department and the Agricultural and Rural Development Corporation are apparently derived from lump sum or periodic appropriation from general revenue. Loans are issued in more than one instalment but no revolving funds are operated.

Ceylon: loan funds administered by the Department of Fisheries are voted annually by Parliament and are provided in the form of an Advance Account in the budget of the agency.

Hong Kong: four funds are in operation. Loans from a revolving fund of HK\$2 Mil., established by the Government of Hong Kong, are

granted by Government on the recommendation of an Advisory Committee appointed by the Governor and of which the Commissioner for Cooperative Development and Fisheries is the Chairman. A second revolving fund, established to finance loans to fishermen for mechanization and operated by the Cooperative Development and Fisheries Department, is financed by an interest-free loan of £50,000 (HK\$798,000) from the Colonial Development and Welfare Fund to commence operation in 1953. This loan is to be repaid by equal annual instalments of £5,000, which begin at the end of the fifth year of the scheme. A third revolving fund is administered by the F.M.O. This fund has a ceiling of HK\$1½ Mil. (adjusted from time to time in accordance with current demand) and was established from FMO Reserve funds. Other loan funds administered by FMO were provided by CARE Inc., an United States relief agency, which in August 1957 donated HK\$31,000 to provide loans to shrimp fishermen for productive purposes.

India: the Central Government has set aside fixed amounts for development under the Second Five-Year Plan and under the Grow More Food Scheme. Under the former, Rs. 120 million (nearly two thirds of which are to go to the States for the implementation of their development schemes) were allocated for fishery grants or loans. Under the latter scheme, Rs. 6, 443,000 were appropriated for the year 1956-58, with over one half of this amount to be used for loan purposes.

Indonesia: the operation of the Central Sea Fisheries Department, relating to the construction of fishing vessels which are made available to members of fishermen's cooperative associations under hire-purchase arrangements, are financed from annual budget appropriations of ca. RP. 10, 000. As far as the financing of the operations of the Farmer's and Fishermen's Bank is concerned, its basic capital amounting to RP. 100 million was to be provided by the Government. Five percent of issued capital, as priority shares, were to remain at all times in Government hands, the remainder to be transferred gradually to cooperative organizations. Details regarding the financing of fishery credit operations of the Indonesian

People's Bank, the Government Pawn Service, and the Institute for Credit Guarantee are not available.

Japan: the funds of the Agriculture, Forestry and Fisheries Financing Corporation are derived from (a) annual Government appropriations, the funds thus obtained being used on a revolving fund basis, 10 percent of loan capital being available to fisheries (in 1957 Y7 billion were appropriated; by the end of the year total appropriations had amounted to Y57.2 billion); (b) loans from other Government sources (at the end of 1957 a total of Y61.5 billion in such loans was outstanding). The share capital of the Japan Development Bank was subscribed by the Government. Funds available for loans amounted to Y60 billion in the fiscal year 1957-58, one percent of which was allocated to fisheries. No information is available on the sources of funds of the People's Finance Corporation, the Finance Corporation for Smaller Enterprises, or the Hokkaido and Tohoku Districts Development Corporation.

Federation of Malaya: the Department of Cooperative Development administers a revolving fund of M\$. 3 million established in September 1956.

Philippines: the Agricultural Credit and Cooperative Financing Administration (ACCFA) administers a revolving fund in the amount of US\$.50 million (100 million pesos) which is used for loans to farmers' and fishermen's cooperatives. The lending operations of the Development Bank of the Philippines are financed through bond issued, capital funds of the Bank, and reinvestment of loan repayments.

Thailand: the Government established a revolving fund in the Ministry of Agriculture to be used for the loan scheme administered by the Department of Fisheries. At the end of 1960, the capital in the revolving fund amounted to about 6.4 million baths. The funds consist of both borrowings from the Ministry of Finance and budgetary appropriations.

U.S.A. (State of Hawaii): The Fisheries Loan Fund is a revolving fund which must be returned to the United States Treasury on June 30,

1956. The Act originally provided \$ 10,000,000 for this fund but the amount was increased to \$ 20,000,000 by an Act of September 2, 1958.

IV. PURPOSES FOR WHICH CREDIT IS EXTENDED

The purposes for which public credit is extended to the fisheries industries are extremely varied. A large majority of schemes, however, is designed to benefit primarily the fishing sector. This is explainable in terms of the special risks the operations in this sector are exposed to and the difficulties experienced by fishermen, as a consequence, in obtaining loans from regular commercial lending institutions.

Depending on policy objectives, the government may advance loan funds to develop the industry and establish somebody in business, assist going concerns in improving operations, or provide relief in distress. Fishery credit schemes in the countries of the Indo-Pacific region, in the majority of instances, are designed to further development objectives or to bring about increased efficiency of operations. To the extent that information has been made available, the objectives of schemes in operation are as follows:

Australia: funds standing to the credit of the Fisheries Development Trust Account may be applied for the following purposes:

- (a) the initiation or continuation of research or investigation in connection with, or for the promotion of, the fishing industry;
- (b) financial assistance by way of loan or provision of share capital or otherwise to persons engaged or proposing to become engaged in the fishing industry;
- (c) the establishment or development of the fishing industry in a particular place or for a particular purpose;
- (d) the training of persons in connection with the fishing industry;
- (e) the dissemination of information and advice relating to scientific, technical and commercial matters in connection with the fishing industry;

- (f) the publication of scientific, technical and commercial reports, periodicals, books and papers in connection with the fishing industry; and
- (g) any purpose incidental to a purpose referred to in the preceding paragraphs.

New South Wales: loans made to cooperatives by the Chief Secretary from the Fish Marketing Fund were intended for development of facilities and, in some instances, to stabilize the financial position of the cooperatives. Guarantees on loans to fishermen's cooperatives in their promotional phase were given to enable them to facilitate acquisition of essential boats and equipment.

Queensland: advances made by the Fish Board are being made to finance the purchase of vessels, engines and fishing gear.

South Australia: State Bank loans are for purchase of boats and engines and to approved companies for the improvement of processing facilities.

Tasmania: loans may be made by the Agricultural Bank of Tasmania for the development of the fishing industry and for other, not specified, purposes.

Victoria: Rural Finance Corporation loans have been made to assist fishermen unable to obtain credit from other sources and to facilitate construction of cold storage facilities.

Western Australia: specific information on purposes of loans not available.

Burma: loans made by the Agricultural and Rural Development Corporation and the Cooperative Department are for purchase of gear, acquisition or improvement of craft, and for fishing operations by fishermen and fishermen's cooperatives, respectively.

Ceylon: Department of Fisheries' loans to fishermen have been made for the purchase of gear or of materials for the manufacture of fishing gear, for the purchase and construction of craft and for the mechanization of wind-propelled craft, for the purchase of a mechanically propelled

craft, a reasonable amount of fishing gear and the cost of the first year's insurance of the boat, and for repairs to fishing gear and craft. Loan to cooperatives have been made for the acquisition or construction of craft and the acquisition or manufacture of gear; in some instances, credit has been extended also for the purchase of motor lorries and the construction of sheds for the storage of fishing gear. Loans to cooperatives are issued also for repairs of fishing craft and gear, marketing operations and subsistence of members.

Hong Kong: The revolving fund established by the Government of Hong Kong is to provide the larger loans required to build, equip and maintain mid-and distant-water fishing vessels. Cooperative Development and Fisheries Department loans are exclusively to facilitate purchase and installation of diesel engines and/or winches. Loans made by the F.M.O. to individual fishermen are made to assist: purchase of gear, acquisition or improvement of craft, acquisition of engines, advancement of wage to crews, mechanization of big fishing vessels and construction of new vessels, and for any other "productive purpose". Loans to co-operative societies are made for the same purposes as for individual fishermen and, in addition, loans have been granted for dwelling houses for members, for purchase of a mechanized transport boat to collect catches from members operating wind-driven boats and other facilities, and for operating expenses of consumers' cooperative societies. Loans for pond fish culture are made from the Kadoorie Agriculture Aid Loan Fund and the J.E. Joseph Trust Fund through the Agriculture and Forestry Department and the Cooperative Development and Fisheries Department respectively.

India: government credit under the Second Five Year Plan and the Grow More Food Scheme administered by the Ministry of Food and Agriculture is extended exclusively to cooperative associations. Purposes for which funds have been advanced are as follows: to clear partly existing prior debts to money lenders, to purchase fishing equipment such as craft and tackle and other requisites for fishing, to purchase or construct buildings (godowns, curing sheds, etc.), to

repair and reclaim tanks, and to cover other miscellaneous day to day expenditures.

Indonesia: credit extended by the Central Sea Fisheries Department is intended to assist in rationalizing and increasing fish production. Farmers' and Fishermen's Bank loans to fishermen are for purchase of gear materials, fish fry, the acquisition or improvement of craft, and for any other purposes such as paying advances to crews and purchase of requisites. Merchants, processors and retailers may obtain credit assistance from the Bank for assembly and storage of fresh, dried or otherwise processed fish (especially during seasonal peaks of production), and for purchase of transport facilities, equipment, etc. The Bank also extends loans to cooperatives, e.g. for acquisition of a dredge, the opening of a service station and the purchase of other facilities as well as for any other expenses such as the operation of auction halls, repair of roads leading to docking places, etc. Loans have also been made by the Central Cooperative Service to the Federation of Indonesian Fisheries Cooperatives for the purpose of financing the purchase of fisheries requisites produced in the country or for the import of such requisites and for the acquisition and/or improvement of craft. In Central Java, the local government has advanced a sum to the local Inland Fisheries Service for the purpose of making this amount available in loan form at low interest rates or at no interest to fish farmers. The Institute of Credit Guarantee issued loans for the purpose of expanding fish producing and marketing operations. Detailed information regarding the credit operations of the Indonesian People's Bank and the Government Pawn Service are not available.

Japan: the Finance Corporation for Agriculture, Forestry and Fisheries extends loans to fishermen for the construction, improvement and acquisition of craft, purchase of synthetic fibre nets, and acquisition of facilities for fish culture. The Corporation also advances funds to cooperatives for equipment of fishing ports, ice-making, refrigerating and other facilities, and for the improvement, construction and reconstruction of joint-use facilities. The Japan Development Bank extends loans to individual entrepreneurs

for the construction of craft and ice-making and refrigerating facilities. The Finance Corporation for Smaller Enterprises provides funds for the erection of facilities by, and long-term working capital for, processors and retailers. Processing cooperatives are granted loans for necessary equipment and for operating funds. The People's Finance Corporation provides long-term financing in modest amounts for fishing operations. The Hokkaido and Tohoku Districts Development Corporation extends long-term loans to canners, synthetic fibre net manufacturers and ice-making plant operators. Under the "Medium and Small Fishermen Guarantee Law", loans by the various lending institutions for construction, acquisition or improvement of craft, engines and equipment, as well as loans for operating expenses, are insured by special insurance association established for this purpose by the fishing industry and the prefectural governments. These associations are in turn insured by a special fund administered by the Central Government.

Federation of Malaya: the Department of Cooperative Development extends loans to fishermen and fishermen's cooperatives for acquisition or improvement of craft and for purchases of gear, and to cooperatives in addition for other not further specified purposes.

Pakistan: nylon twine, engines and wood for the building of boats is imported and supplied by the Government on a credit basis (without interest) to individual fishermen and cooperatives. The Pakistan Industrial Finance Corporation and Agriculture Bank extends loans to established firms for acquisition and improvement of freezing and ice-making establishments, cold storages, canning, fish meal and fish manure plants and other facilities. Loans of this type are made available also to cooperatives provided they possess immovable property which can serve as security.

Philippines: the Philippine National Bank extends loans to fishermen for the purchase of gear and other fishing equipment, acquisition and improvement of fishing vessels, operating expenses of fishermen and fish pond operators, and improvement of fish ponds. The Bank also lends money to merchants and retailers for

operating expenses, and to processors for the purchase of facilities and for operating expenses. The Development Bank of the Philippines provides funds for the conversion of swamplands into productive fish ponds and/or for the rehabilitation of established fish ponds for the purpose of increasing yields. It also extends credit for the preservation of fish and fish products. The Agricultural Credit and Cooperative Financing Administration (ACCFA) assists fishermen and cooperatives through the Farmers' Cooperative Marketing Associations in the acquisition of facilities for handling, storage, processing and packing or packaging. ACCFA also grants merchandising loans to these Associations for purchasing the catches of their fishermen members and the processing of supplies into fish paste and fish sauce; also to the Central Cooperative Exchange for purchase of raw material (for processing in its own plant), and processed products (for marketing) from the Farmers' Cooperative Marketing Associations. ACCFA also makes commodity loans to the Farmers' Cooperative Marketing Associations on their stock of raw material to be processed and on finished products for use as additional funds in procuring raw material and processing supplies from members and other sources. However, loans of the latter type do not cover administrative, labor, freight and other operating expenses.

Thailand: Department of Fisheries loans are for the acquisition or improvement of craft, the purchase of engines and gear, as well as for the improvement of fishing craft and gear. The Department also extends loans for the purchase of radio telephones and echo-sounders, and for construction of fish ponds.

U.S.A. (Hawaii State): The purpose of the Fishery Loan Fund is to provide funds for the rehabilitation of the domestic fishing industry. Loans may be obtained for the financing and refinancing of operations, maintenance, replacement, repair, and equipment of fishing gear and vessels, and for research into the basic problems of fisheries.

The Small Business Administration extends loans to small manufacturers, wholesalers,

retailers, service establishments and other small businesses for:

1. Business construction, conversion or expansion.
2. The purchase of equipment, facilities, machinery supplies or materials.
3. Working capital.

V. PROCEDURES FOLLOWED IN THE ADMINISTRATION OF SCHEMES

Information was assembled on the following aspects of the administration of credit schemes in the countries of the Indo-Pacific region:

- (i) criteria applied, and procedures followed, in the selection of beneficiaries and requirements for the provision of security in loan agreements;
- (ii) terms on which loans are extended and repayment provisions.

The data made available are summarized below under the above-listed to headings:

- (i) **Criteria applied, and procedures followed, in the selection of beneficiaries and requirements for the provision of security in Loan Agreements :**

Australia: expenditures from the Fisheries Development Trust Account can only be made for "purposes of the Commonwealth". In the payment of funds from the Account, the Minister takes into consideration recommendations made by the Inter-departmental Advisory Committee on Fisheries Development. The general policy has been to reserve the fund for the investigation and development of major fisheries projects. Details on the State credit schemes are not available.

Burma: loans are awarded to bona fide owners and organization-operatives who are honest, have sound experience, and are not connected with fish agents. Cooperatives are required to provide immovable property as loan security. In case of loans made to individual fishermen by the Fisheries Division of the Agricultural and Rural Development Corporation,

joint-surety arrangements are made, and there is no requirement to provide property as loan security.

Ceylon: loans to cooperative societies are issued on the basis of the borrower's estimated repaying capacity. Repaying capacity is determined from the operational statements of the societies by further taking into account the estimated increase in income which is expected as a result of the purchase of new equipment or as a result of the repairs made to existing equipment. Loan applications are scrutinized and investigated by the field staff of both the Fisheries Department and the Cooperative Department. Craft and gear which is acquired, constructed or repaired is hypothecated to the Cooperative Provincial Bank. In the case of loans issued to Fishermen's Cooperative Credit and Sales Societies, the individually owned craft or gear of the members is assigned to the society as security. Some of the recently registered fishermen's cooperatives are incorporated with unlimited liability. Craft and gear belonging to societies and on which loans are issued are not normally insured. In the case of loans to individuals, where the loan does not exceed Rs. 500/-, the craft or gear owned or acquired by the borrower is mortgaged to the Government and a personal bond for repayment on time of the debt is furnished in addition. In the case of loans to individuals of Rs. 500/- to Rs. 3,000/-, the borrower is required to furnish a personal bond with two sureties for due repayment of the debt in addition to mortgaging the property. In the case of loans to individuals over Rs. 3,000/-, the borrower is required to mortgage land with acceptable title to the Government as security for the repayment of the loan. Loans to individual fishermen for the financing of craft and gear must be insured with an insurance company approved by the Department. Under the new loan scheme for the mechanization of fishing craft introduced in August 1958, no other security is needed than the boat, the ownership of which is retained by the Government under a hire-purchase arrangement. The new scheme aims to make borrowing by fishermen easier, since under previously existing arrangements, fishermen had to put up collateral in the form of immovable property for loans in excess of Rs. 3,000/-. The new scheme

is intended to serve the dual purpose of providing credit as well as serving as propaganda for mechanized fishing. Persons to whom these loans are issued—

- (i) must be skilled, industrious and enterprising fishermen who are not satisfied with earning an income just sufficient for subsistence, but are prepared to better their income by the use of new methods and hard work or, in the case of new-comers to the industry, they must be energetic and enterprising persons;
- (ii) must be sufficiently outstanding in the fishing community in providing the initial leadership and in furthering the program of mechanization in the fishing community.

Applications for these loans, too, are enquired into and reported on by the field officers of the Fisheries Department.

Hong Kong: Applications for loans from the Fisheries Department Loan Fund are made to the Cooperative Development and Fisheries Department which investigate each application prior to submission to the Advisory Committee appointed by Government for this purpose. Owners of one or more fishing vessels capable of operating in mid-and distant-waters and commercial trawler companies are eligible to apply for loans from this fund. The amounts lent depend on individual requirements, but all purposes for which money is borrowed must be productive. Security is arranged against mortgage of vessels and repayments are arranged through the F.M.O. by deduction from proceeds of sale of catches. Loans by the F.M.O. are issued to any fisherman who owns a fishing vessel. Size of loan depends on applicant's actual needs, his ability to repay, his standing with the Organization and so forth. So far, only one loan extended for the purchase of trawlers has been secured by a mortgage and the usual arrangements for security are for the individual fishermen borrowers to provide one or more fishermen guarantors. In the case of borrowers being members of credit cooperative societies, the loans are guaranteed by the societies. When the F.M.O. Loan exceeds HK\$1,000 the Marine

Department is informed that the F.M.O. has a financial interest in the boat. The Commissioner for Cooperative Development and Fisheries is to be informed by the Marine Department should the borrower desire to have a transfer of ownership of his vessel recorded before the loan is fully repaid. Insurance arrangements are made only in special cases when specifically required by the Commissioner for Cooperative Development and Fisheries. Loan by the Co-operative development and Fisheries Department are granted to owners of small vessels on the basis of the operator's general standing with the F.M.O. and on market catch records. Small boat fishermen operating from remote villages, who have previously had no alternative but to pass their catches through collectors, are not on that account excluded from considerations. Application is made by the individual fisherman who has to obtain sureties either from two other reputable fishermen or from a cooperative society. As to collateral arrangements, a lien on the boat is not required in connection with the provision of loans which are for the purchase and installation of diesel engines and/or winches. The Director of Marine, who licenses all fishing craft, is however informed that the Government has a financial interest in the boat and the Co-operative Development and Fisheries Department consequently is notified if the fisherman applies to register a change of ownership before the loan is fully repaid. Fishermen borrowers are guaranteed either by a cooperative society or by two other fishermen of good standing as in the case of F.M.O. loans. The engine for which a loan is obtained has to be insured by the borrower for the amount outstanding on his loan.

India : the main criteria for the award of a loan are the solvency of the member of the co-operative, his reputation in the community, his capacity to pay and his essential needs. Fishermen who have been trained in off-shore fishing at various off-shore fishing training centres are supplied mechanized craft under hire-purchase arrangements. The relative importance of a particular fishing centre may make it eligible for the award of a loan for the acquisition of a fishing curing yard or godown. Under existing hire-purchase arrangements, the title to property for

which a loan has been granted vests with the government until the value has been paid in full. In certain cases, a group of members of a co-operative have obtained fishing craft on the security of imovable property. There are no specific insurance arrangements in connection with the extension of loans.

Indonesia : Loans made under the Special Welfare Scheme of the Central Sea Fisheries Department: Applications originating from fishermen through their cooperative organizations are screened by the Department in cooperation with the Central Cooperative Service and the Federation of Indonesian Fisheries Cooperatives. In the case of loans to individual enterprises, the Sea Fisheries Department conducts the investigation itself, frequently with the assistance of local authority. Under the hire-purchase arrangements, the title to property for which a loan has been granted remains with the Government until the value has been paid in full. The Sea Fisheries Department has the power to intervene with full authority under the agreement with the beneficiary if the stipulations regarding use and maintenance of equipment are not fulfilled by the borrower.

Loans by the Farmers' and Fishermen's Bank: Applications by the cooperative organizations have to be submitted together with a note of approval by the local sea fisheries and cooperative services to channeling bodies, viz. local and autonomous cooperative organizations, finance corporations, banks, etc., organized under a central board, which after proper investigations, pass the applications to the Bank. There are no specific mortgage requirements. The Bank, however, is instead entitled to make use of the so-called 'credit-string' to secure its credits where such is needed. Collateral arrangements are made in some instances and insurance too is required in certain cases.

Institute of Credit Guarantee: prior investigation of applications by the Sea Fisheries or Inland Fisheries Service is required. Mortgage or other collateral has to be furnished and insurance arrangements must be made in addition.

Japan : the following criteria are applied by the specialized lending institutions in the selec-

tion of beneficiaries: (1) business results of the enterprise, (2) what use is to be made of the loan, (3) repayment plans, (4) character, age, ability, skill, etc., of applicant, (5) size of funds available for loan purposes as estimated for a period of two or three years, (6) business prospects of borrower's enterprise (location of facilities, customers, labor conditions, etc.). Generally, loans for operating expenses are granted without collateral requirements. Repayments, as a rule, are made through direct deduction from catch proceeds. For equipment loans, sureties must be furnished as well as such collateral as personal effects or fixed property. Borrowers are required to take out fire and loss insurance on the facilities to be acquired.

Federation of Malaya: loan applicants must be *bona fide* fishermen and members of cooperative associations. They must be able to put up 10 per cent of the amount of the loans applied for. On boats and gear which are supplied on a hire-purchase basis, the Government retains title until full value is paid; mortgage security has to be provided on loans for processing or storage facilities.

Pakistan: imported requisites are issued only to *bona fide* fishermen after inspection of their boats. The Government has set up Allocation Committees who lay down procedures for distributing these articles and also supervise their actual distribution to the fishermen. The equipment is issued to the fishermen after they have completed a bond obligating themselves to pay the cost on an instalment basis. Two sureties have to be provided who are responsible for payment in case of default. The boat of the allottee is also mortgaged in the name of the issuing authority until such time as he clears his debt. Insurance arrangements are not required at the present time.

Philippines: criteria and procedures for the selection of beneficiaries are as follows: Philippine National Bank: the moral reputation and credit standing of the applicant, the liquidity and solvency of the applicant, the assets offered as collateral, the estimated income of the applicant. Procedures for the selection of borrower: (1) the applicant is interviewed by the manager or assistant manager; (2) if the purpose of the loan falls

under the Bank's policy and the required securities are met, the applicant fills out the appropriate application form; (3) besides the application form, the applicant is required to submit his financial statement, income tax return, title and other supporting papers; (4) applicants in the provinces are required to deposit an amount sufficient to defray expenses for inspection; (5) the inspection and appraisal of the property offered as security and a credit investigation on the applicant are assigned to an inspector and/or investigator. In the meantime, an information sheet is passed around the different departments of the Bank to ascertain the customer's liabilities with the Bank; (6) the reports of the inspector and investigator, as well as other documents, are returned to the credit analyst or chief of loans and accounts department for analysis. Recommendation for approval or disapproval is made by the Assistant manager in the head office or the chief of the loans and discounts in the provincial branches; (7) For loans falling under the discretionary power of the branch office, approval is made by the manager himself. Manila office must be informed of such action. (8) For loans beyond the power of the branch, the manager forwards his recommendation to the branches department of the head office for further processing. (9) In the case of industrial loans, aside from the processor's report, the papers may be referred to the department of economics, research and statistics and to the industrial consultants of the credit department for analysis. All long-term industrial loans must be approved by the board of directors after passing through proper channels. (10) Approval of non-industrial loans in the head office may be made by the Board, the Executive Committee, the Supervising Vice President or Department Manager upon the amount of loan involved. (11) Release of the loan may be made after proper documentation and registration and full compliance with all the conditions specified in the approval of the loan.

Development Bank of the Philippines: loans are granted to: (a) those who already own established fishponds but want to improve them to increase production, and (b) those who desire to engage in the fishpond business and have already secured from the government ten-year

fishpond lease agreement covering the areas they want to develop into fishpounds.

Agricultural Credit and Cooperative Finance Administration: Beneficiaries are limited to ACCFA affiliated Farmers' Cooperative Marketing Associations with fishermen members, and to the Central Cooperative Exchange. Fishermen qualifying for membership in the aforementioned FaCoMas fall under the following categories: (1) Operator of a fishing vessel of not more than 35 gross tons used as primary or secondary gear, resides or has his agent in the municipality where his base of operation is located, and employs his fishing crews under written profit sharing agreement enforceable for at least one year; provided that such operator or his agent, who shall be under written contract, has had at least one year's experience in commercial fishing operation. (2) An individual who works as a member of a fishing crew under a profit-sharing agreement in connection with the operation of a fishing vessel of any tonnage used as primary or secondary gear, and resides in the municipality where the base of the fishing operation is located; provided that such individual has had at least one year experience in commercial fishing operation. (3) An individual who has graduated from a recognized school of fisheries, local or foreign, with at least two years of college level training and a minimum of six months of "practice in the fisheries industry" duly certified by a government or government recognized fisheries training institute or school of fisheries and who is engaged either as an operator of a fishing vessel or member of a fishing crew under profit-sharing agreement. Requirements for security made by the Philippine National Bank and the Development Bank of the Philippines include: mortgages on immovable property such as land and buildings, chattel mortgages on equipment, corporate securities listed on the Manila Stock Exchange, and other personal properties acceptable to the Banks. In addition, property for which loans are advanced by the Development Bank of the Philippines must be insured by the borrower. Under loans made by the Agricultural Credit and Cooperative Administration (ACCFA) requirements are as follows: For facility loans, the security is a mortgage on the facility to be acquired, except

a facility loan for acquisition of fish containers which is secured by a real estate mortgage or a chattel mortgage on a fishing boat, provided that the loan does not exceed 50 percent of the appraised value of the boat; for merchandising loans, the security is a chattel mortgage on the Farmers' Cooperative Marketing Association or Central Cooperative Exchange assets of sufficient value; for commodity loans, the products in storage by the Farmers' Cooperative Marketing Association serve as collateral—receipt of storage must be indorsed and filed with ACCFA. Facilities (except fish containers) used as collateral for ACCFA loans, have to be insured with insurance companies acceptable to ACCFA, preferably with the Government Service Insurance System.

Thailand: The loan applications have to be approved by the committee which has been appointed by the Ministry of Agriculture. The Committee consists of:

- (1) Director-General, Department of Fisheries—Chairman
- (2) Deputy Director-General, Department of Fisheries
- (3) Director of Wholesale Fish Market Organization
- (4) The representative of Ministry of Finance
- (5) Chief, Division of Inland Fisheries, Department of Fisheries
- (6) Chief, Administrative Division, Department of Fisheries—Committee Secretary.

The security may be a guarantee furnished by commercial banks, or first mortgage on land, mechanized boats or houses.

U.S.A. (State of Hawaii): Fishery Loan Fund—Any person residing or conducting business in any state shall be deemed to be a qualified applicant for financial assistance if:

- (a) He owns a commercial fishing vessel of United States registry (if registration is required) used directly in the conduct of fishing operations irrespective of the type, size, power, or other characteristics of such vessel.

- (b) He owns any type of commercial fishing gear used directly in the capture of fish.
- (c) He is directly engaged in commercial fishing operations using a fishing vessel of United States registry (if registration is required) or fishing gear under his control on a lease or share basis; or
- (d) He owns or controls any property, equipment, or facilities useful in conducting research into the basic problem of fisheries or possesses scientific, technological, or other skills useful in conducting such research.

The following credit requirements must also be met before a loan can be granted:

- (a) There must be evidence of applicant's ability to operate successfully.
- (b) The past earning record and future prospects are considered in determining ability to repay the loan out of earnings of the vessel.
- (c) The loan must be of sound value and so secured as to reasonably assure repayment.

The proposed collateral for a loan must be of such a nature that when considered with the integrity and ability of the management, and the applicant's past and prospective earnings, repayment of the loan will be reasonably assured. Collateral may consist of a vessel mortgage, mortgages on other property and such guarantees that may be necessary.

Small Business Administration—The SBA has set certain size standards which must be met. A business concern must be small, this being determined by the number employed, by the amount of sales or by amount of receipts. It must be independently owned and operated and non-dominant in its field. The loan applicant must meet these requirements also:

- (a) The applicant must be of good character.

- (b) There must be evidence he has the ability to operate his business successfully.
- (c) He must have enough capital in the business so that, with loan assistance from the SBA, it will be possible for him to operate on a sound financial basis.
- (d) The proposed loan must be of such sound value or so secured that repayment will reasonably be assured.
- (e) The proposed collateral and the past earning record and future prospects of the firm must indicate ability to repay a loan.

(ii) **Terms on which loans are extended and repayment provisions:**

- (a) *Proportion of total amount required by borrower represented by loan*

Government loans do not necessarily cover the entire cost of facilities to be acquired or the operating capital needed by the borrower. As a rule, there is some differentiation by type of loan, a higher proportion for example being provided for facility loans than for loans to cover operating expenses. The ability of one borrower to put up a higher proportion of total costs may influence the award of loans when applications are being screened. Information assembled on this aspect is as follows:

Burma: On loans for gear, fishing craft, fishing requisites, etc., 100 percent of the cost is advances; on loans for operating expenses, 20 percent.

Ceylon: Loans may cover costs in total or in part, with total coverage of costs being the rule.

Hong Kong: Loans extended from the Fisheries Development Loan Fund and by the Co-operative Development and Fisheries Department, each case being decided on merit. Loans extended by the F.M.O.: on average it is estimated approximately 80-90 percent of total costs is provided.

India: The fishermen's cooperatives are allocated specific sums (Normally Rs. 14,000). The funds are made available to as many fishermen members as possible according to their needs (amounts received by individual fishermen in the majority of instances ranging from Rs. 100 to 200). Under this allocation method, the proportion of funds received to total requirements will vary from individual to individual.

Indonesia: Loans made by the Farmers' and Fishermen's Bank usually represent more than 75 percent of total funds required. No information is available on the procedures followed by the other lending institutions.

Japan: The Agriculture, Forestry and Fisheries Financing Corporation: the minimum or maximum amount per loan is established by law in accordance with the purpose for which the loan is made in order to secure equitable distribution of funds and, at the same time, to make lending operations more efficient. In the case of loans insured under the "Medium and Small Fishermen Finance Guarantee Law", loans amounting to five times as much as the share investment in the insurance association can be made to the individual fisherman. In the case of loans for operating expenses, 80 percent of the total costs can be lent and, in the case of loans for craft, gear or other equipment, 60 percent. The maximum amount of loan per borrower extended by the Finance Corporation for Smaller Enterprises is Y10 million, per cooperative Y30 million. The range of People's Finance Corporation loans is Y20,000-500,000 per person; for a corporate organization the maximum is Y2 million. Loans made by the Hokkaido and Tohoku Districts Development Corporation provide 50 percent of the cost of facilities, the maximum amount of individual loans being Y50 million.

Federation of Malaya: The loans granted by the Department of Cooperative Development cover the full amount of expenditures required, but an individual loan must not exceed ten times the capital of the fishermen's cooperative to which it is granted.

Pakistan: The Government issues import licences to the cooperatives for specified amounts for the acquisition of requisites abroad.

Philippines: Philippine National Bank: the funds advanced are related to the value of the securities offered but under no circumstances must exceed the actual needs of the applicant as determined by the Bank. The loan value of the security offered is computed on the following basis: 70 percent of the appraised value of real estate and 50 percent of the appraised value of movable properties. Development Bank of the Philippines: loan amounts are equivalent to 60 percent of the appraised value of the security offered. Agricultural Credit and Cooperative Financing Administration (ACCFA): in the case of facility loans, the amount of individual loans must not exceed 80 percent of total cost, but for facilities with major parts made of steel or concrete materials, the loan amount may be 100 percent of the cost; for fish containers, 100 percent of the cost is advanced. In the case of commodity loans, the amount granted is 80 percent of the wholesale market value in principal distributing centers. In the case of merchandising loans, the amount is related to the operations of the borrowing Farmers' Cooperative Marketing Association.

Thailand: The Department of Fisheries advances 60 percent of total costs. The loan can not exceed 50 percent of the value of the property which is mortgaged.

U.S.A. (State of Hawaii): Fishery Loan Fund Applicants for loans for purposes other than replacement of fishing gear and vessels are required to have invested not less than 20% of the value of the vessel and gear as equity capital in the venture, except in unusual cases. Applicants for loans for more than \$15,000 for replacement of fishing gear and vessels are required to provide at least 20% of the purchase price or cost of construction of the replacement as equity capital. For loans of \$15,000 or less, this requirement may be relaxed but as substantial an amount of equity capital as the applicant can provide is required.

Small Business Administration—The amount which may be borrowed from the SBA depends upon how much is needed for the intended purpose of the loan.

(b) Interest rates charged

Among the principal purposes of the establishment of government credit facilities is to provide loans at interest rates which are lower than those charged by private credit institutions and thereby to facilitate borrowing. Information on interest charges on public loans to fishery industries in the Indo-Pacific region has been assembled as follows:

Burma: The Fisheries Division of the Agricultural and Rural Development Corporation provides loans direct to fishermen at the interest rate of 6.25 percent p.a. Loans by the Cooperative Department are extended to the Rangoon Fish Marketing Cooperative at 6.25 percent p.a., and the latter in turn provides loans to affiliated producers' cooperatives at the rate of 12.5 percent p.a.

Ceylon: 3 percent p.a. interest is charged to individual fishermen, 2 percent p.a. to registered cooperative societies.

Hong Kong: Interest on loans from the Fisheries Development Loan Fund is $\frac{1}{2}\%$ per month on outstanding balances; the F.M.O. charges $\frac{1}{4}$ per cent per month on outstanding balances on loans issued to fishery cooperatives and 10 percent p.a. on those issued to individual fishermen; the rate of 10 percent per annum is calculated on a quarterly basis, i.e. $2\frac{1}{2}$ percent on loans repaid in the first three months, 5 percent on loans repaid in six months, and $7\frac{1}{2}$ percent on loans repaid in more than six months. As many of these loans are for very short terms and are repaid within three to six months, the interest charged in practice often amounts to only $2\frac{1}{2}$ —5 percent of the amount loaned. The interest rate on loans for the mechanization of fishing craft is 6 percent.

India: Interest rates on loans issued by the Central Government to State Governments are decided from time to time by the Ministry of Finance, depending on the nature and purposes of the loans. For example, long-term loans for a period of 10, 15 and 20 years are provided at interest rates of 4, $4\frac{1}{2}$, $4\frac{3}{4}$ percent p.a., respectively, medium-term loans for 5 and 7 years at rates of

$3\frac{5}{8}$ and $3\frac{7}{8}$ percent p.a. respectively, and short-term loans for 18 months at $3\frac{1}{8}$ percent p.a. The rates of interest charged by State Governments vary from State to State. Cooperative societies generally charge 2 percent p.a. on amounts received from Government. Loans issued directly by the State Governments are available to fishermen at the rate of 5 to $6\frac{1}{4}$ percent p.a., whereas those that are routed through apex and central banks are available only at higher rates of interest.

Indonesia: Interest rates are 12 percent p.a. on both Institute Credit Guarantee and Farmer's and Fishermen's Bank loans. The rates are relatively high since funds for these purposes have to be obtained from other banking institutions.

Japan: Interest rates on loans extended by the Agriculture, Forestry and Fisheries Financing Corporation vary according to the purposes of the loans. Interest is 6.5 percent p.a. on loans for the building of fishing port facilities, 7.5 percent p.a. on loans for the purchase of fishing vessels, and 7.5 percent p.a. on loans for building processing facilities. In cases in which loans are extended for repair or reconstruction of facilities damaged by natural disasters, interest rates are lowered by 0.5 percent. The Japan Development Bank and the Hokkaido and Tohoku Districts Development Corporation charge 9 percent p.a. interest, whereas the rate on loans extended by the Finance Corporation for Smaller Enterprises and by the People's Finance Corporation is 9.6 percent p.a.

Federation of Malaya: Interest charge is 1 percent per month on outstanding balances.

Pakistan: The requisites imported for the fishermen are made available at cost.

Philippines: The Philippine National Bank and the Development Bank of the Philippines charge 6 percent p.a., with a rebate of 1 percent for the loans repaid on time in the case of loans made by the former. The interest rates on Agricultural Credit and Cooperative Financing Administration loans differ according to purposes:

8 percent p.a. for facility loans, 6 percent p.a. for commodity loans, and 7 percent p.a. for merchandising loans.

Thailand: An 8 percent p.a. interest rate is charged on Department of Fisheries loans. (The Department of Fisheries pays the interest of 4% p.a. for the borrowings from the Ministry of Finance).

U.S.A. (State of Hawaii): Fishery Loan Fund—The interest rate of 5% per annum is charged on the actual amount outstanding.

Small Business Administration—The interest rate on the SBA's *direct loans* (loans made to the borrower by SBA entirely and directly) and the maximum interest rate on the SBA's share of a *participation loan* (loan in which SBA joins with a bank or other private lending institutions) is 5½. A private lending institution may set a higher rate than 5½ on its share of a participation loan provided the rate is legal and reasonable. If a private institution sets a rate lower than 5½ per annum on its share of a loan, the interest rate on the SBA share shall be the same, except that in no case may the SBA interest rate be less than 5%.

(c) *Repayment provisions*

Information assembled under this heading is as follows:

Burma: Loans extended by the Cooperative Department and the Agricultural and Rural Development Corporation are apparently all short term. Repayments normally are to be made at the end of the fishing season, and collection is effected through deduction from sales proceeds. This deduction is compulsory and made by agents appointed by the loan-issuing Government agencies. Loans made by the Agricultural and Rural Development Corporation may be repaid in three annual instalments. This provision, however, does not apply in the case of loans to cooperatives extended by the Cooperative Department.

Ceylon: Maximum length of time for which loans are extended varies with type of loans as follows:

- (a) Acquisition of a mechanically propelled boat under the new scheme 5 years
- (b) Purchase or acquisition of craft 3 years
- (c) Mechanization of craft 3 years
- (d) Purchase or manufacture of fishing gear 2 years
(Under the scheme of loans to individual fishermen, loans for the purchase or manufacture of fishing gear are repayable in one year)
- (e) Repairs to craft or gear . . . 1 year
- (f) Marketing and subsistence. . 1 year
- (g) Other equipment, e.g. equipment for the processing of beche-de-mer 1 year
- (h) Sheds 1 years
- (i) Motor lorry 5 years

Payment are made in monthly instalments. Payments are normally received during the fishing season which may extend over 4, 6, 10 or 12 months. In the case of cooperative societies, collections are made through the Cooperative Provincial Banks. In the case of individual fishermen, collections are made through the Department's field staff. In the case of cooperative associations, collection is effected through the Cooperative Provincial Banks; in the case of individual fishermen, through the field staff of the Department of Fisheries.

Hong Kong: Loans issued from the fisheries Development Loan Fund are issued subject to a maximum repayment period of 5 years. Co-operative Development and Fisheries Department: loans are normally for a two- year period. In cases of genuine hardship, extensions may be granted. Collection is made through a deduction of 25 percent of proceeds from sale made by the F.M.O. on behalf of the Department. F.M.O.: Loans normally do not exceed one year, with extensions granted in hardship cases. In the case of larger capital loans, the repayment period may extend from 5 to 10 years. Repayments are made by means of a percentage deduction from sales proceeds. The percentage on such deduction varies

from 15-30 percent in accordance with the borrower's ability to pay and as stipulated in the loan agreement and in the by-laws of a cooperative society.

India : Long-term, medium-term, and short-term loans are repayable within a period of 10 to 20 years, 5 to 7 years, and 18 months, respectively. In the case of long and medium-term loans, repayments are to be made by the State Governments to the Central Government in equal annual instalments to start with the first anniversary date of the loan grant. Short-term loans are cleared within a specified period in as frequent instalments as possible. Collection is effected by issuance of monthly demand notices to the societies by the State Governments, and the President of each society attends to the collection of the instalments from the members or groups of members with the assistance of the staff of the cooperative. The collections are remitted to the nearest treasury office every month. The respective District Fisheries Offices keep track of recoveries.

Indonesia : Institute of Credit Guarantee : loans are for a maximum of 6 years if applied for investment purposes, and for a maximum 3 years if applied to cover operating expenses. Repayments are effected on a monthly basis or otherwise, if so stipulated in the loan agreement, and must be made to the banks from which the loans were obtained. Central Sea Fisheries Department : cooperatives collect from their members. Repayments on loans to individual fishermen are sent directly to the Sea Fisheries Department through its local offices. Farmers' and Fishermen's Bank : for the time being, the Bank provides short-term loans only, extending over one year or less. Repayments are made through deduction from proceeds of fish sold by the borrower at fish auctions where sale is in such manner. In other instances, repayment arrangements are stipulated in the loan agreement.

Japan : Agriculture, Forestry and Fisheries Financing Corporation : loans for improvement of fishing ports and other major facilities are for 15 years or less; for fishing craft and for synthetic fibre nets, for 10 years or less, Finance Corporation for Smaller Enterprises and Japan Development Bank : loans are for 5 years or less. People's

Finance Corporation : loans are for periods of not more than 3-5 years. Hokkaido and Tohoku Districts Development Corporation : loans for operating funds are for 5 years or less, for equipment for 10 years or less. As far as the timing of repayments is concerned, this is specified only for those operations where definite fishing seasons exist and where collection is effected at the end of the seasons. Repayments on loans for operating funds which, in general, are unsecured, are made through deduction from sales proceeds. The cooperatives usually accumulate such funds for eventual remittance to credit agencies.

Federation of Malaya : Loans on craft and gear are repaid in three years, loans on ice plants such as the one acquired by the East Coast Fishermen's Cooperative Transport and Marketing Union over a period of three to five years. Payments in the first instance are effected on a monthly, in the latter instance on a semi-annual, basis. Collection from members of cooperative associations is made through their organizations. The Transport and Marketing Union remits directly on the loan obtained for the ice plant.

Pakistan : The value of requisites obtained must be repaid in the case of nylon twine within two to three years, and in the case of marine diesel engines within three to five years. Payments are made on a monthly basis with no collections being made during the monsoon season (June through August). Since distribution of requisites provided is through the cooperative associations, collection is effected through them. In case any difficulties are experienced in the collection of instalments, the Department of Fisheries and the Registrar of Cooperative Societies come to the assistance of the cooperative association; they also function as court of judgement against defaulters.

Philippines : Philippine National Bank : short-term loans are for 120 days to one year; long-term industrial loans for 5 to 10 years. The short-term loans are payable in lump sum when due. Collection is effected in the following manner : ten days (Manila Office) or thirty days (Provincial Branches and Agencies), at least, before maturity date, the Bank sends the borrower an 'Advice of Maturity Date'. If the loan is paid

on time, an interest rebate of one percent is made. If not paid on time, the loan is recorded as past due and a reminder is sent to the borrower. If the loan remains unpaid, arrangements for a personal interview with the borrower are made so that an agreement can be found regarding the liquidation of the loan. Legal action is taken when no repayments are made despite repeated demands for such. Development Bank of the Philippines: loans are for periods from 5 to 10 years. Collections are made on a quarterly or monthly basis with special attention given to ability to pay at the end of the season. Agricultural Credit and Cooperative Finance Administration: terms on facility loans or for fixed facilities are for 10 years; for semi-permanent facilities, 5 years; for movable facilities, 3 to 5 years; and for fish containers, 1 year. The standing Government policy is to have loan repayments coincide with the borrower's capacity to pay from the sales of his products and this is taken into consideration in the timing of the loan agreement. At least two weeks prior to due dates, ACCFA sends a statement of accounts to the Farmers' Cooperative Marketing Association to be followed by a bill immediately after the date of maturity. Payment is made by check drawn by the Association debtor in favor of ACCFA and sent either through the ACCFA Provincial District Director concerned or directly to BCCFA, in which case a copy of the letter of transmittal is furnished the Provincial District Director.

Thailand: Loans are extended for a period of two years with repayments made every 3 months either directly to the Department of Fisheries or to the Provincial Fisheries Officers.

U.S.A. (State of Hawaii): Fishery Loan Fund—The period of maturity of any loan is determined and fixed according to circumstances but the maximum time is ten years. Loans are repayable in installments, preferably in monthly installments. All or part of a loan may be repaid without penalty before it is due.

Small Business Administration—The maximum maturity on loans is ten years. SBA loans generally are repayable in regular monthly installments, including interest on the unpaid balance.

VI. REVIEW OF OPERATION OF SCHEMES

In response to the FAO enquiry, governments reviewed existing credit schemes as follows:

Australia: The extent of direct government financial assistance to fishery industries is somewhat limited in Australia. However, if the moneys advanced by the various State sponsored banks is taken into account, the credit position is more satisfactory than it appears at first sight. The major portion of finance has come essentially from private sources and trading banks. These funds have been supplemented by financing provided by State banks. The Commonwealth's Fisheries Development Trust Account has, and will, assist substantially in the development of the Australian fishing industry. There is no fund in Australia, however, which on a Commonwealth basis makes small loans to fishermen for the purchase of vessels, gear and other equipment. Quite a number of fishermen's cooperatives do grant credit for the purchase of these items, particularly for the purchase of gear and equipment. In addition, the banks, either Government sponsored or privately owned, make similar accommodations. Furthermore, the banks also assist the industry by granting what might be termed operating and trading capital facilities to the industry.

Burma: Progress, on the whole, was not considered entirely satisfactory by the Government when the reply to the FAO questionnaire was being prepared in November 1958. The program was still relatively new, however, and a review was planned after the third year of operation to determine whether the scheme was to be continued. From other sources it has been reported that many of the vessels financed were turned into passenger ferries. The fact that a disproportionately large amount of loans was granted for operating expenses was cited among the principal shortcomings of the scheme. The scheme was said to have been abandoned by the Government by the end of 1959.

Ceylon: The Government loan program has helped the existing 48 active fishermen's cooperatives in meeting the following expenditures (up to 1959):

Purchase of construction of craft	Rs. 230,328/—
Purchase or construction of fishing gear	129,364/—
Repair to craft	54,785/—
Repairs to fishing gear . .	216,705/—
Marketing	92,591/—
Subsistence	104,730/—
Construction of sheds . . .	880/—
Purchase of lorry	16,000/—

The following are cited among the principal problems in the administration of the fishery credit scheme: (1) the fact that a large number of cooperative associations are organized on the promise that Government loans will be made available to them. This induces many fishermen to join cooperatives for no other reason than to share in the benefits to be obtained from the use of the loan capital. Beyond this element they have nothing that ties them to the cooperative and, consequently, do not take part in the activities of the organization (e.g. by marketing their fish through the cooperative) nor do they want to contribute to the liquidation of the debts of the cooperative; (2) because of fluctuating income in the fisheries, it is often difficult to estimate the repaying capacity of a cooperative; (3) only 3,500 of the 79,000 persons engaged in the fishing industry in Ceylon are organized in cooperative associations. Fishermen not belonging to cooperatives must offer reasonable security before loans are issued to them. Since most of them are unable to offer such security, a large percentage of Ceylon's fishermen are unable to benefit from the Government loan scheme.

Hong Kong: Since 30 December 1953, a total of 125 loans amounting to HK\$780,580 have been granted, initially by the Department of Agriculture, Fisheries and Forestry Department (now the Agriculture and Forestry Department) and subsequently, since 1st June, 1960, by the Co-operative Development and Fisheries Department. Commercial firms have followed the lead set by the Government, and sold engines on hire-purchase terms. The F.M.O. has granted a total of 5,377 loans amounting to over HK\$7 millions from the time of the establishment of its

loan fund in September 1946 to the end of October 1960.

India: The Central Government indicates that appreciable progress has been achieved through the grants and loans provided to the fishing industry. In recent years, the number of mechanized boats on the coast of Bombay, Kerala and Madras States have been on the increase, nylon nets have been popularized, ice plants and cold storages installed in important fish landing centres, and the fishermen partially or completely freed from their dependency on the middlemen. In addition, quick transport facilities have been made available and curing yards and storage godowns installed, and fishermen's cooperatives have been induced to take over the marketing of the fish of their members. The cumulative effect of these efforts, it is said, has been a considerable increase in fish production and a corresponding rise in the economic standards of the fishing population. It is planned to maintain the gains achieved so far and to accelerate the rate of progress by increasing the funds and facilities to be made available to the industry.

Indonesia: It has not been possible as yet to appraise results achieved under the new scheme administered by the Farmers' and Fishermen's Bank. In general, hire-purchase arrangements are deemed to be the best way for assisting the fishermen who for the most part belong to the less educated and less prosperous segment of the population and who, by means of a well-supervised program can be given systematic training in the use of the new mechanized equipment and consequently may be enabled to substantially increase production. Experience with the Institute of Credit Guarantee scheme is being described as rather unfortunate, primarily because the majority of applicants has been unable to meet the requirements applied by the Institute.

Japan: The following information on loans awarded by the various Government credit institutions has been made available. Finance Corporation for Agriculture, Forestry and Fisheries: in the period from 1951 to 1957, loans in the total amount of about Y24,461 million were

granted to fishery industries; this total is distributed by the specific purposes as follows:

Fishing ports	2,170	millions of yen
Fishing boats . . .	14,144	" " "
Facilities for cooperative use . .	7,621	" " "
Synthetic fishing nets of fishing companies and individuals	508	" " "

Note: Of the above loans, some were advanced for disaster relief purposes. Japan Development Bank; the balance of outstanding loans to fishery enterprises was Y 1,349 million as of the end of March 1958. Finance Corporation for Smaller Enterprises: particulars on loans to fishery enterprises not available. People's Finance Corporation: funds loaned to fishery enterprises in 1957 amounted to Y 327 million. Hokkaido and Tohoku Districts Development Corporation: the balance of outstanding loans to fishery industries was Y 722 million as of the end of September 1958; of this amount Y 653 million had been granted for ice-making and refrigerating facilities, Y 29 million for fishing nets and ropes, and Y 40 million for the manufacture of processed products.

Federation of Malaya: The East Coast Fishermen's Cooperative Transport and Marketing Union has been enable to purchase an ice plant and a number of lorries and insulated and covered vans for transport. In addition, a number of fishermen's cooperatives have acquired fish curing sheds with the loan funds put at their disposal. Future development aims at the establishment of central fish landing and the organization of an efficient distribution system. This will require organization of proper auction procedures and construction of cold storage facilities at both landing and marketing centers.

Pakistan: It has been estimated by the Government that as a result of making nylon twine available to the fishermen alone, fish production was increased by 20 percent. Other equipment provided included thirty outboard engines for craft which were made available to

the fishermen to improve the condition of catches landed. Since the engines had to be operated with gasoline, however, they proved to be uneconomical and this form of assistance, consequently, was abandoned. Supply of inboard engines is being continued and it is hoped that the entire fishing fleet off Karachi can be mechanized within a period of five years. So far in excess of 150 inboard engines have already been distributed to the fishermen. The outstanding need to make the program fully effective is to provide training facilities for the fishermen to teach them how to use the new equipment and to improve fishing methods.

Philippines: Philippine National Bank: in 1957, the latest year for which data have been furnished, the total amount of loans granted was 5,374,000 pesos. At the end of that year, total loans outstanding amounted to 8,978,000 pesos. Short-term loans accounted for the bulk of these amounts, since long-term industrial financing was initiated only in 1956. The Bank considers the lack of business acumen and technical knowledge on the part of the fishermen the principal obstacle preventing it from expanding its loan assistance to the industry, and believes an effective educational program may be the only remedy for this situation. Development Bank of the Philippines: in the period from 2 January 1947 to 30 June 1958 the Bank approved 2,006 loans aggregating 31,179,619 pesos for the development of fishery industries, almost 85 percent of this amount for fish pond development, the remainder for deep-sea fishing and for processing of dried fish. The Development Bank stresses the need for expanding processing, refrigerating, and marketing facilities to ensure that full benefits are reaped from the Government assistance program. Agricultural Credit and Cooperative Financing Administration (ACCFA): since the start of ACCFA financing fisheries projects in August 1956, the following assistance has been provided: (a) the Balatan Fish Meal Project operated by the Central Cooperative Exchange: ACCFA purchased a Hiller Fish Processing Machine for 40,955 pesos and loaned it to the Exchange for exploratory fish meal manufacture. In addition to the facilities and working capital provided, ACCFA also furnished technical assis-

tance. (b) the Coron (Palawan) Bagoong Repacking Plant: ACCFA issued to the Coron Farmers' Cooperative Marketing Association a facility loan for fish containers of 25,141 pesos, a commodity loan of 44,189 pesos, and a merchandising loan of 60,000 pesos for the manufacture of fish paste and fish sauce from the surplus anchovy catch of the fishermen members of the Association. In addition to these loans, ACCFA provides three technologists to assist the Association personnel in the operation of the plant. ACCFA feels that the principal problems attending to the operation of its loan program to fishery industries are (i) the fact that the projects assisted do not possess adequate working capital and that ACCFA policy does not permit it to make up for this deficiency, and (ii) poor support by the fishermen members of the Farmers' Cooperative Marketing Associations in the delivery of catches to supply the projects with sufficient raw material at minimum cost.

Thailand: From 1957 to September 1960, the number of applications for loans was 450, a total amount of Baht 39,000,000. The committee approved the applications as follows:

Year	No. of Applications Approved	Amount of loans (Baht)
1958	92	3,228,500
1959	24	955,500
1960	7	300,000
	<u>123</u>	<u>4,484,000</u>

The following project has been submitted to the National Economics Development Bureau, seeking loans for the period 1961-1966. These are:

1. Loan for sea fisheries—Baht 3,000,000 p.a. for the full period.
2. Loan for fish culture—Baht 1,500,000 p.a. for the full period.
3. Loan for fish processing—Baht 500,000 p.a. for the full period.

U.S.A. (State of Hawaii): Fishery loan Fund—Since the start of the program in Hawaii in 1956, seven loans have been approved totaling \$73,256. The loans ranged from \$3,250 to \$20,000,

1.2 The Financial Status of Fishermen in the Indo-Pacific Region

I. INTRODUCTION

II. INVESTIGATIONS SO FAR CONDUCTED

III. CERTAIN FINDINGS AND DATA OBTAINED

IV. ACTION TAKEN OR PROPOSED

I. INTRODUCTION

At the 8th Session of the Indo-Pacific Fisheries Council, a report entitled "Report on Government Credit Facilities for Fishing Industries in the Indo-Pacific Region" was presented as a result of inter-sessional activities of Panel C, Technical Committee II and the Fish Marketing Sub-Committee. This was a first step in compiling a comprehensive factual report on credit facilities in the Region. The Council considered the study useful and at the same time decided to continue and expand its scope to include, preferably, information on sources and terms of available non-governmental credit facilities.

A questionnaire concerning "Investigation and Assessment of the Financial Situation of Fishermen" was circulated to the members of Panel C and Fish Marketing Sub-Committee, and replies have so far been received from Australia, Ceylon, Japan, the Netherlands New Guinea, North Borneo, Pakistan, the Philippines and the U.S.A. (Hawaii State) and the information has been incorporated in the present report.

When preparing the questionnaire, it was not thought feasible to ask for quantitative information on sources and level of non-governmental and non-institutional credit, such as that provided by merchants, money-lenders, etc., since, evidently, a very large proportion of such transactions is unrecorded and would in any case be obscured by the reticence of the creditors. It was therefore considered more realistic to try to form some estimate of the fishermen's credit requirements for all purposes, on the basis of investigations already available. Information on government credit facilities was, to a great extent, covered in the previous report and, in relation to this, it

was thought that the credit situation of fishermen might be clarified.

However, information on the fishermen's financial situation included in the present report is far from complete and lacks uniformity. This seems largely due to the lack of investigations in many countries on this subject, as also to lack of uniformity of definitions and concepts in different countries with respect to various expenses, earnings and also enterprise itself in the fishing industry, the structure of which varies greatly from country to country. A study is now being made by FAO with a view to throwing some light on the concepts, definitions and conventions in costs and earnings studies, in order to assist member countries in this field. In the meantime, it is hoped that the present report will give some idea of existing surveys and of the financial status of fishermen in a number of IPFC member countries and particularly, of the need for government assistance.

II. INVESTIGATIONS SO FAR CONDUCTED

In some countries organized investigations have been conducted on the financial situation of fishermen. In many countries, however, such investigations are made within the broader limits of rural population in general. Apart from these organized investigations, it is usual practice for governmental or private credit institutions to conduct an enquiry into the financial standing of individual fishermen, in order to deal with their loan applications. In such cases, no published reports are available and it is necessary to estimate the general situation of fishermen from individual experience. To the extent that information has been made available, the following will indicate how investigations are dealt with in various countries.

Australia: Since there is no overall Government plan to provide financial assistance for fishermen, there has been no organized investigation or assessment of fishermen's credit requirements. Such investigations have been limited to those by lending authorities, arising from requests for loans from individual fishermen.

Ceylon:

a) "*A Survey of Rural Indebtedness*" (published in 1959)

This survey was conducted by the Department of Census and Statistics in 1957, and included about a 1% sample of the total rural population, including fishermen. It deals with household consumption requirements, earnings, indebtedness, sources and conditions of loans.

b) "*A Survey of Ceylon Fisheries with Special Emphasis on Cooperatives and Cooperative Development*"

This survey was made in 1954 under the sponsorship of the Department of Fisheries, by Mr. A.H. MacDonald, Cooperative Consultant of the Canadian Fisheries Project. The survey touched on requirements for household consumption, earnings from fishing, indebtedness, and sources and conditions of loans.

c) "*Socio-Economic Survey of Fishery Families*"

This was a sample survey carried out by the Department of Fisheries in 1958. The sampling fraction was about 2% of the total number of the fishermen's families. The report of the survey, which has not yet been published, deals with requirements for working expenses and for household consumption, earnings from fishing operations, indebtedness, and sources and conditions of loans.

d) "*Economic and Rural Family Budget Survey*"

This survey was formerly conducted by the Department of Commerce and Industries since as early as 1935 and has been continued by the Department of Census and Statistics. However, information on fishermen is not sufficient for an adequate assessment of their financial situation.

e) *Sample Survey of Ceylon Consumer Finances, 1953*

This survey embodies the finding of the Central Bank of Ceylon.

f) In addition to the specific investigations mentioned in a) - e) above, information is now being collected regularly on mechanized fishing operations, particularly with respect to working expenses and earnings. *The Administrative Report of the Director of Fisheries for 1959* will also contain information on the financial situation of fishermen.

Japan :

a) Since 1952, a *Fisheries Economic Survey* has been carried out annually by the Statistics and Survey Division of the Ministry of Agriculture and Forestry. It is based on some 700 fishing households and enterprises, selected from various types and strata of fisheries and it includes investigations on costs and earnings of fishing operations. The purpose of the survey is to obtain better understanding of the management of fishery enterprises as a basis for drawing up fisheries policies.

b) "*Monthly Statistics Report on Loans*" is published by the Bank of Japan. It includes figures and purposes of the loans extended to all sectors of industries classified by types of lending institutions. Fishing and processing industries constitute a part of the report.

c) Apart from those mentioned above, no specific investigations have been made. However, lending institutions—including governmental, cooperative and commercial banks—investigate the financial situation of fishermen or firms in connection with their lending operations.

Netherlands New Guinea : The fishing in the Territory is still in the primitive stage (subsistence) and no organized investigations have so far been made.

North Borneo : Limited investigations have been undertaken by the Government on requirements of funds for capital equipment and earnings from fishing operations.

Pakistan : A *Survey of 18 fishing villages around Karachi* was made in 1955-56 by the Central Fisheries Department, with respect to financial conditions of fishermen. However, the records are not available.

Philippines : Investigations are carried out by the three Government-sponsored credit institutions, namely the Agricultural Credit and Cooperative Financing Administration (ACCFA), the Development Bank of Philippines (DBP) and the Philippine National Bank (PNB), primarily for the purpose of determining the advisability of granting loans to particular fishermen or enterprises.

U.S.A. (Hawaii) : Except for wage surveys, no surveys have been made on the financial situation of the Hawaiian fishermen by the State or Federal Governments or financial institutions.

III. CERTAIN FINDINGS AND DATA OBTAINED

Ceylon : On the basis of the various investigations mentioned in Section I, the following findings are reported :

- a) In most cases, the members of a fishing unit divide earnings in an agreed proportion, depending on the degree of specialization and/or the amount of fishing equipment possessed by each member. Cash payments of a fixed amount are sometimes made to casual labourers for dragging beach seine nets.
- b) During the off-season, fishermen are engaged either in migrant fishing or in other work than fishing. Some of them are completely unemployed.
- c) Expenses for fishing are various, but a large proportion of expenditure is incurred for repairs and replacement of fishing gear, for bait and, in the case of the beach-seine fishing, for labour for hauling nets.
- d) Fishermen's families whose household expenditures exceeded their net income amount to 76% of the total families.
- e) More than half the household expenditure is on food.
- f) Indebtedness among fishermen is high. About 59% of the total fishermen's families were in debt. The average debt per indebted family was about Rs. 840/—, i.e. about five times the average net income of a family per fishing seasons. Most of the debts were secured by mortgages. About 65% of them were incurred for household expenses and 15% for repairs of fishing gear and purchase of fishing accessories.
- g) Due to the availability of free educational facilities and to the gradually increasing opportunities in other occupations for the children of fishermen, about 32% of fishermen's families wanted their sons to take up some other occupation than fishing in view of its present uncertain income.

The following has been extracted from the Survey of Rural Indebtedness, 1957, to show the fishermen's financial position. (Figures for Agricultural and Handicraft families are also cited for the purpose of comparison).

	Occupational Groups		
	Agriculture	Handicraft	Fishing
Number of families surveyed	7,452	1,276	367
Number of families indebted	4,447	703	236
Percentage of families indebted	60	55	64
Average debt per family Rs.	449	246	542
Average debt per indebted family Rs.	753	446	844
Average annual income per family Rs.	1,133	1,051	962
Average value of assets per family Rs.	4,869	1,994	2,528
Average size of family	5.5	5.5	5.5
Number of income earners per family	1.4	1.3	1.3

Japan: Necessary working expenses, including those for purchase of fuel, provisions, ice and bait, etc., are usually met for the profits of previous fishing trips. Fishing boats are repaired immediately after the fishing season, when fishermen are comparatively well off. Therefore, except for the initial fishing trip when the fishermen obtain funds for working expenses from commercial or cooperative credit institutions, there is little need of loans for working expenses.

Governmental, cooperative or commercial credit institutions extend loans for the acquisition of capital equipment according to the

national development plan and to the merit of individual enterprises.

Loans are made for household expenses by fishery cooperatives to their members within the limits of their shares in the cooperative.

In the following, some finding with respect to costs and earnings of small-scale fishermen are extracted from the Fisheries Economic Survey, 1956 (small-scale fishermen depend also on sources of income from other occupations than fishing, and therefore the survey deals also with these as an inseparable part of the fishermen's economy).

TABLE I
Average Earnings from all Sources for Fishing Households, 1956
(before taxes)
(YEN)

Types of Operation		Non-powered Boats	0-3 ton Powered Boats	3-10 ton Powered Boats
Fishing Operation	Income	178,114	447,877	1,245,225
	Expenses	62,264	225,784	870,331
	Net Income	115,856	222,093	374,894
Fishery Products Processing	Income	11,515	21,859	88,406
	Expenses	8,562	15,554	78,076
	Net Income	2,953	6,305	10,330
Farming	Income	43,064	36,501	20,131
	Expenses	14,358	10,226	7,195
	Net Income	28,706	26,275	12,936
Other Industrial Activities	Income	7,304	7,937	10,139
	Expenses	1,540	3,269	4,315
	Net Income	5,764	4,668	5,824
Other Sources	Income	101,055	84,622	110,074
	Expenses	2,526	4,361	9,836
	Net Income	98,529	80,261	100,238
All Operations	Total Net Income	251,802	339,602	504,222

TABLE II
Average Fishing Production Costs for Fishing Households, 1959
(not including taxes)
(YEN)

		Non-powered Boats	0-3 ton Powered Boats	3-10 ton Powered Boats
Expenses	Wages of Employees	13,020	63,542	368,104
	Fishing Nets and Gear	10,591	25,203	71,265
	Fuel and Oil	420	34,824	118,067
	Bait, Light and Heat	4,282	18,023	39,342
	Boat Maintenance	1,253	12,898	49,040
	Culture	1,828	4,351	6,631
	Other	12,802	27,108	87,307
	Depreciation	18,068	39,744	130,575
Total Expenses		62,264	225,784	870,331
Imputed Wages of Family		87,165	155,157	235,072
Imputed Interest on Invested Capital		14,488	39,567	110,158
Total Fishing Production Cost		163,917	420,508	1,215,561

TABLE III
Average Fishing Profits and Average Earnings from Fishing for Fishing Households, 1956
(before taxes)
(YEN)

Classification of Operations		Non-powered Boats	0-3 ton Powered Boats	3-10 ton Powered Boats
Fishing Profits	Income from Operations	178,114	447,877	1,245,225
	Production Cost	163,917	420,508	1,215,561
	Fishery Profits	14,197	27,369	29,664
Earnings from Fishing	Imputed Wages of Family	87,165	155,157	235,072
	Imputed Interest on Capital	14,488	39,567	110,158
	Fishing Profits	14,197	27,369	29,664
	Earnings from Fishing	115,850	222,093	274,894

TABLE IV
Average Economic Surplus for Fishing Households, 1956

Classification of Operations	(4) Total Earnings from All Sources	(9) Taxes, public imposts, charges	(10) Household expenses	(11)=(4)-(9)-(10) Economic Surplus
	yen	yen	yen	yen
Non-powered boats	251,802	9,166	251,665	(—) 9,029
0-3 ton powered boats	339,602	12,509	319,783	7,310
3-10 ton powered boats	504,222	29,643	426,899	47,680

Netherlands New Guinea :

Earnings : The living requirements of the inhabitants of the various parts of Netherlands New Guinea show considerable differences, and outside the urban areas fisheries form part of the subsistence economy of the native population.

Along the Supiori coast of Geelvick Bay, at a great distance from the town of Biak, sales possibilities are limited and the *per capita* income of the fishing population is estimated at Fls. 50 a month. The living requirements of the local fishermen are low and are based on the native diet.

At Hollandia, where the selling price of fish is substantially higher than outside the urban area, the annual net income in 1957 of 150 fishermen operating outboard motor-driven canoes was estimated at Fls. 280,000, which works out at a monthly *per capita* income of Fls. 150. In addition, the Hollandia fishermen secure an income from wage labour.

Indebtedness : Particulars on this item are only available from the "Chena Tadge" fishermen's cooperative at Hollandia.

On 31 May 1960, the total debt of the members to the cooperative amounted to Fls. 12,188, working out at a *per capita* debt of approximately Fls. 170.

North Borneo : With regard to earnings from fishing operations, information is available in respect to one small Co-operative Society formed in 1959. The society consisted of some 25 members owing 12-14 small boats. During the year they realised M\$ 15,900 for the fish sold. The members are free from debt in respect to fishing tackle, outboard engines and other fishing equipment. They also operate small areas of rice land and so are not entirely dependent on their fishing.

With regard to funds for the acquisition of capital equipment, another group (not a cooperative) of some 25 members received from the North Borneo Credit Corporation a loan of M\$16,000/- to buy 11 outboard engines. Results showed that the fishing methods used (with outboard engines varying from 3½ to 35 H.P.) were not economic and the loan could not be repaid.

Pakistan :

Indebtedness : Marine fishermen in Pakistan are extremely poor and more than 75% of the active fishermen are indebted either to money lenders or capitalists locally known as "Mole-Holder". (They are also auctioneers of the dry and fresh fish, who at times are also the buyers and exporters of fish). Loans are mostly taken before the monsoon seasons for repairs of boats and nets or for procurement of fishing gear and equipment. The indebtedness varies from Rs. 500/- to Rs. 10,000/- depending upon the "Karkhana" i.e. the capacity of the boat and the catch record of the owner of the vessel. The vessel owners borrow money for working expenses and capital equipment and also for household expenses, death, marriage or other ceremonies. The catches brought by the borrower are auctioned through the same money-lender who deducts 10% to 20% from the sale proceeds of each catch. In most cases, the major part of the loan is always outstanding against the borrower and thus goes on accumulating from year to year and is transferred from father to son.

Earnings : Earnings per month during a fishing season for various types of fishermen and boat owners are estimated as follows (with the exception of trawlers, the crew work on a catch share basis).

1. Active Fishermen on Tonny
Rs. 60/- to 100/- per month
2. Tonny Owner
Rs. 100/- to 150/- „ „
3. Active Fishermen on medium
size sail boat
Rs. 100/- to 150/- „ „
4. Boat Owner
Rs. 200/- to 300/- „ „
5. Active fishermen of large
size sail boat
Rs. 150/- to 200/- „ „
6. Boat owner of the large size
Rs. 300/- to 500/- „ „
- 7 Active fishermen on launch
Rs. 200/- to 300/- „ „

8. Launch owner
Rs. 1,500/- to 3,000/- per month
9. Active fishermen on Trawlers
Rs. 150/- to 200/- „ „
10. Trawler owner
Rs. 1,500/- to 3,000/- „ „

Philippines: Although information on small-scale fishermen has not been given, an example of requirements for working expenses and earnings of a 29 gross ton trawler is reported by the Philippine National Bank as follows :

a) *Working Expenses for One Year.*

Salaries and wages	P 29,640
Supplies	29,400
Depreciation	11,100
Insurance	2,220
Fees and Licenses	744
Total	P 73,104

The breakdown is as follows :

(1) *Wages and Salaries.*

1 Captain	P 2,400
1 Chief Engineer	2,400
2 Mates and 2 Asst. Engineers	7,200
6 Fishermen	8,640
1 Driver	1,800
2 Labourers	2,880
3 Members	4,320
Total	P 29,640

(2) *Supplies.*

Fuel oil—984 drums, P 24.50 per drum	P 24,108
Lubricating oil—18 drums, P 150 per drum	2,700
Food per person at 1 peso per day (12 crew members)	2,592
Total	P 29,400

- (3) Depreciation was calculated on the basis of replacement cost and depreciation rates recommended by the Bureau of Fisheries.

Item	Replacement cost	Depreciation Rate	Amount
Hull	P 29,000	7½ %	P 2,175
Engines installed	55,000	7½ %	4,125
Nets and equipment (gear)	6,000	30 %	1,800
Truck	12,000	25 %	3,000
Total	P 102,000		P 11,100

- (4) Insurance of vessels at P 150 per month and of fishermen at P 35 per person per year were computed by the Bureau of Fisheries on the average insurance policies carried by registered trawling operations.

(5) *Fees and Licenses are as follows :*

Customs for P 5.00 (mo.)	P 60
Berthing fee P 20 (mo.)	240
Fisherman's License, P 2 per person	12
Fish caught, fee P 2 per ton	432
Total	P 744

- b) *Earnings from fishing operations during one year of a trawler with a gross tonnage of 29 tons.*

Estimated sales (216 tons at P 500 per ton, prevailing prices of mixed fishes)	P 108,000
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Total Estimated expenses

Working expenses as given in 1 (a)	P 73,104
Administrative expenses	3,672
Interest	6,000
Estimated net profit	P 25,224

U.S.A. (Hawaii State)

- (a) Requirements for working expenses vary with the type of fishery and the basic requirements for the principal fisheries; namely, inshore and offshore fisheries. These fisheries are broken down to types and the requirements for a 12-month period are as follows :

(1) Offshore*Tuna livebait*

Gear, netting, hooks, poles, lines, ropes etc.	\$2,600.00
Fuel, lube oil and gasoline	6,000.00
Food	2,700.00
Ice	1,200.00
Maintenance (includes dry-docking and related repairs, skiff repairs, engine and equipment repairs)	5,000.00
Total	\$17,500.00

Tuna longlining

Gear, bait, ropes, hooks, floats, wire etc.	\$4,200.00
Fuel, lube oil, gasoline	1,800.00
Food	1,600.00
Ice	1,800.00
Maintenance	1,800.00
Total	\$11,200.00

(2) Inshore*Net fishing*

Fishing gear and equipment	\$3,500.00
Ice	1,200.00
Fuel, lube oil, gasoline	1,600.00
Food	1,500.00
Maintenance	1,200.00
Total	\$9,000.00

Bottom fishing

Anchors, rope, gear, bait etc.	\$1,950.00
Ice	1,850.00
Fuel, lube oil, gasoline	1,735.00
Food	1,900.00
Maintenance	1,200.00
Total	\$8,635.00

Funds for the above working expenses are available through credit.

In the tuna bait fishery, the fish cannery extends credit to boatowners for certain working expenses such as fuel, lube oil and ice. Credit

for food is not extended. Such expenses are usually repaid within a week and are taken from the top; i.e. deducted from the gross income from fish catch sales for that week. Following this, earnings are divided between the boatowner and crew. Expenses for food are taken from the crew's share before the earnings are divided among the fishermen.

Credit is extended for limited periods. Reliable fishermen are extended greater credit privileges over a longer repayment period than others. When the accumulated debt is too large, the cannery advises the boatowner to cease operations until there is indication that a catch can be brought in. An undisclosed interest rate is charged on accounts overdue.

Expenses such as ship's dry-docking, painting, repairs, alterations, purchasing and repairing of gear and equipment are the responsibility of the boatowner. Shipyards extend credit to responsible fishermen for any shipyard work under arrangements similar to the cannery. Past performance, earnings of the vessel, integrity of the owner and the future prospective earnings of the vessel are considered before credit is extended. Payment, otherwise, is due immediately upon completion of the work.

For the purchase of fishing gear and equipment, credit is extended by the supplier on a short-term basis not contingent on the fish catches.

(b) Requirements of funds for acquisition of capital equipment, is related to the specific equipment and its use. Requirements for new vessels, complete with equipment necessary to engage in the fishery, are as follows:

80 ft. live bait boat including engine	\$110,000
60 ft. longline boat including engine	80,000
50 ft. net boat including engine	60,000
40 ft. bottom fishing boat including engine	15,000

A vessel owner raises his equity capital through his own enterprises, through loans from friends and relatives; and, if additional funds are required, the balance is obtained from commercial banks or lending institutions.

IV. ACTION TAKEN OR PROPOSED

Ceylon: It is felt that the credit needs of fishermen should be provided, for many years to come, by Government or Government-sponsored institutions. At present, only a small fraction of the fish produced by the registered cooperative fishing societies is purchased by the Central Cooperative Fish Sales Union. Generally, fishermen deliver the fish to middlemen at a fixed low price in return for their advances during the off-season or during periods of poor fishing in previous seasons, not only for the purchase of capital and for working expenses but often for subsistence. Consequently, the fishermen's indebtedness is high, but the present availability of reasonable government credit (2% interest to cooperatives and 3% to individuals repayable in one to three fishing seasons) is very little and furthermore the loans are available only for the purchase and/or repair of fishing craft and equipment in both mechanized and non-mechanized fishing operations.

Japan: In order to deal with needs which cannot at present be met by credit institutions, the Government has instituted (besides financing funds for capital equipment through Agriculture, Forestry and Fisheries Financing Corporation), a loan guarantee system and, in cases of typhoon damages or other natural disasters, gives interest allowance to fishermen. It is also the Government policy to strengthen fishery cooperatives which either extend loans to members or assume joint liabilities for the loans to fishermen.

North Borneo: The Government believes that the interests of fishermen can be served by encouraging the use of larger vessels than those at present in use which are capable of fishing inshore only and by improved methods of fishing and marketing. Funds have recently been provided for the purchase (by the Government) of two trawlers costing M\$10,000 each, which will be hired to more enterprising fishermen in the first instance and, if results are found to be economic, later sold to them. Loan facilities for such purchase by private individuals or groups are available through the North Borneo Credit Corporation, a quasi-Government body operating with Government funds.

Pakistan: It is planned to conduct investigations on the financial situation of fishermen on an 'all-Pakistan' basis, with the cooperation of the Central Statistical Office and of educational institutions.

It is strongly felt that the Government should have a large stock of engines and fishing equipment to supply to fishermen on a credit basis through fishermen's cooperatives. This credit, in the form of articles, has been found suitable, except that a very small amount of cash may be loaned for day-to-day expenses or household consumption. (So far 160 marine diesel engines and a large quantity of nylon twine have been distributed by the Government).

Philippines: No overall study on the financial needs of the fishermen is contemplated in the near future, but establishment of a credit cooperative is considered a great help to small fishermen who have little access to institutional credit owing to lack of securities.

U.S.A. (Hawaii State): The Small Business Administration, an independent agency of the Federal Government, extends loans for the purchase of vessels, engines and other equipment.

The Fisheries Loan Fund, administered by the U.S. Secretary of the Interior through the Office of Loans and Grants, makes loans for the financing and refinancing of operations, maintenance, replacement, repair and equipment of fishing gear and vessels to qualified members of the fishing industry only when financial assistance is not otherwise available on reasonable terms.

The fishermen have been advised of the availability of the Fisheries Loan Fund through the Loans and Grants Officer who has arranged to meet with fishery associations to discuss and answer questions on the loan fund. Circulars and applications have been distributed to various sources in the State of Hawaii. The closing of fishery loans are announced in the local newspapers to stimulate interest among the fishermen.

2. FISH MARKETING

2.1 Governmental fish marketing Activities in the Indo-Pacific Region

- I. INTRODUCTION
- II. PUBLIC OR SEMI-PUBLIC OWNERSHIP OF MARKETING FACILITIES AND DIRECT PARTICIPATION IN MARKETING ACTIVITIES BY GOVERNMENT AUTHORITIES
- III. REGULATION OF PRICES AND/OR QUANTITIES MARKETING
- IV. FISCAL AND FINANCIAL MEASURES
- V. TRAINING OF MARKETING PERSONNEL, EXTENSION SERVICES AND PROMOTIONAL ACTIVITIES
- VI. SUPERVISION AND REGULATION OF MARKETING OPERATIONS
- VII. EFFORTS TO LOWER PROCESSING AND MARKETING COSTS
- VIII. TECHNOLOGICAL RESEARCH
- IX. ECONOMIC RESEARCH
- X. MARKETING INTELLIGENCE

I. INTRODUCTION

At the Eighth Session of the IPFC, Colombo, 1958, the Fish Marketing Sub-Committee presented a report "Review of Government Fish Marketing Activities in the Indo-Pacific Region", which was prepared on the basis of the replies so far received in response to a questionnaire previously circulated by the FAO Secretariat.

Replies have since been received from several countries which had not responded earlier to the questionnaire and this additional information has been incorporated in the present report. Other available information has also been used wherever appropriate.

II. PUBLIC OR SEMI-PUBLIC OWNERSHIP OF MARKETING FACILITIES AND DIRECT PARTICIPATION IN MARKETING ACTIVITIES BY GOVERNMENT AUTHORITIES

The degree of the direct participation by governments in fish marketing activities varies from country to country in the Indo-Pacific Re-

gion. In Hong Kong and in Queensland, Australia, wholesale markets are under direct control of the Government Board or semi-government marketing organizations which not only own the wholesale markets but transact the wholesale business.

In a number of countries, the wholesale markets in principal cities at least are owned either by the governments or municipalities under the general supervision of these public authorities, the actual operation being left to licensed merchants. In Japan and Indonesia, fish markets in production centres are owned and operated by fishermen's cooperatives, while in India many State Governments assist fishery cooperatives to undertake marketing operations.

Information by countries on public or semi-public ownership of marketing facilities and direct participation in marketing activities by government authorities is given below:

Australia: State authorities are primarily responsible for the marketing of fresh fish for local consumption. However only two States, Queensland and New South Wales, have organized schemes covering fish marketing in the whole or part of their territory.

New South Wales: the marketing of fish is controlled by the Chief Secretary under the provisions of the Fisheries and Oyster Farm Act 1935/57. The bulk of the catch is sold through the Sydney Fish Market which is owned by the municipality and rented out and supervised by the Chief Secretary's Department. In addition, 19 fishermen's cooperatives have the right to market fish in their own region. Fishermen, except in special circumstances, must dispose of their fish through the cooperatives or through the central market.

Queensland: fish marketing is under the direct control of the Fish Board on which producers, consumers and the Government are represented. All marketing facilities in this State are publicly owned. The Central Market is located in Brisbane. There are 25 additional markets and centres along the Queensland coast from Coolangatta to Port Douglas which receive and distribute fish under the control of the Fish Board.

South Australia: the Adelaide Fish Market is owned and operated by the South Australian Fishermen's Cooperative, Ltd.

Tasmania: there is no organized fish market.

Victoria: although there is no organized State scheme, the Melbourne market is owned and controlled by the municipal authority while other wholesale and retail markets are operated by eight fishermen's cooperative societies.

Western Australia: the Perth Market and the Fremantle Market are government-owned but leased to private individuals who have the right to conduct auctions.

Burma: The Board of Management for the Port of Rangoon owns and manages the Rangoon Wholesale Fish Market. Other wholesale as well as retail marketing facilities are owned and managed by municipalities.

Ceylon: Although the Department of Fisheries is engaged in commercial fish production with two trawlers of its own and is also represented at the Board of Directors of the Ceylon Cooperative Fish Sales Union, the Department does not own any fish marketing facilities nor does it participate in fish marketing activities. However, there is a wholesale and retail market in Colombo (St. John's Market) which is owned by the Colombo Municipal Council. In a few areas auction sheds, with the maintenance of which local authorities are entrusted, have been constructed by the Department of Fisheries.

Hong Kong: The Fish Marketing Organization (FMO), a non-governmental trading organization managed by a government official, the Director of Marketing, owns all wholesale facilities and controls the transportation and the wholesale distribution of marine fish on behalf of the fishermen. The main functions of the Organization are: assembly, transportation from the fish collecting depots to the wholesale markets, and selling. Selling operations include all financial transactions and the transportation of the fish to the business premises of the retailers. At present, the Organization operates five wholesale markets and seven fish collecting depots and posts.

The Government owns also some retail facilities which are rented to fish retailers.

India: The wholesale and retail business is generally in the hands of private merchants, although fish markets are supervised by local administrative organs, i.e. municipalities, *panchayats*, etc. The market premises themselves in some instances are owned by the local authorities. One of the State Governments, Uttar Pradesh, has established a few fish stalls for the sale of fish directly to the public.

Although Central and State Governments do not participate directly in marketing operations, many State Governments, including Bombay, Madras, Orissa and Kerala, have been assisting fishery cooperatives to undertake wholesale operations.

In Kerala, the Indo-Norwegian project initiated a pilot fish marketing scheme in 1956, and operates a fleet of six insulated vans.

An Advisory Committee on Marketing of Fish in Bombay city constituted in 1955 has recommended construction of a new market at Palton Road, in the place of the Arthur Crawford market and the recommendation is under active consideration.

Indonesia: Almost all fish wholesale marketing (auction) activities are in the hands of the fishermen's organizations except where facilities are operated by government authorities or municipalities such as the auction markets in Djakarta and Makassar which are operated by the municipalities, and the wholesale market in North Celebes which is operated by the provincial government authority.

Japan: The National Government does not own any marketing facilities nor does it engage in wholesale or retail operations. Government statutes, however, provide the legal framework in which the wholesale activities are carried out. Under the Central Wholesale Market Law, wholesale markets were established in 16 big municipalities. The markets are administered and controlled by the municipalities but wholesaling itself is carried out by private firms licenced by the Ministry of Agriculture and Forestry. In the case of wholesale markets in

fish landing places, ownership by municipalities is rare and most of them are owned and operated by fishery cooperatives in the respective areas.

Federation of Malaya: In the big production or consumption centres, wholesale marketing facilities are owned and operated by municipalities, while in the small centres they are run by private individuals. Municipalities, however, do not participate in trading operations.

Philippines: Fish markets are owned and operated either by municipal governments or private merchants and all trading operations are in the hands of fishermen and fish merchants.

Pakistan: A new Fish Wholesale Market, Karachi, constructed by the Government was opened in October 1959. The operation of the Karachi Wholesale Fish Market has been entrusted by the Government to the Karachi Fishermen Cooperative Purchase and Sale Society, Ltd. The services of the officer-in-charge, marketing officer and two inspectorate staff have been loaned by the Government to the Society to help it in the administration of the Wholesale Fish Market.

Singapore: Among five wholesale fish markets in Singapore, the two large ones in the city area are owned and controlled by the City Council, while the other three are owned and operated by private individuals.

Thailand: A semi-governmental Fish Marketing Organization has been functioning since 1953 under the control of the Ministry of Agriculture. The Bangkok Fish Market is owned by the Organization and the fish agents licensed by the Government conduct their wholesale business in the market.

III. REGULATION OF PRICES AND/OR QUANTITIES MARKETED

a. Domestic Trade

On the basis of information obtained so far price and quantity controls are rare in the Region.

It is reported from *Cambodia, Indonesia, Japan, Federation of Malaya, the Philippines* and

Thailand that there are no regulations with respect to prices and quantities marketed.

Australia: With the exception of fish supplied to processors, there is no definite regulation of prices and quantities of fish marketed. However, in glut periods, fishermen's cooperatives on occasions impose restrictions on the quantities of fish they will accept from the fishermen. This procedure, however, is exceptional and generally confined only to such species as mullet and Australian salmon.

Ceylon: At the retailing level, there is a requirement in many urban areas that fish be sold to consumers in markets in which there are licensed stalls.

Hong Kong: The flow of domestic supplies from producers to market is regulated. Fish should be sold at the wholesale markets operated by the Fish Marketing Organization.

India :

Orissa: wholesale and retail prices for Chilka Lake fish in the State are fixed by the Orissa Government under the Civil Supplies Act. Fish supplies from Chilka Lake areas to inland markets are also under strict government supervision.

Kerala: In 1959, a sales organization, composed of the owners of mechanized boats in Quilon, was set up and the members were assured of minimum beach-prices for different species which were a little higher than the prevalent rates. This price incentive coupled with cash-payment attracted the attention of other fishermen and it is expected that a large marketing organization will soon be established.

Madras: Wholesale and retail prices for fish sold from fish farms, demonstration tanks, lakes and reservoirs and from inshore and offshore fishing units managed by the Department of Fisheries is fixed by the Director of Fisheries. The prices schedules are revised annually with due regard to market fluctuations, cost of fishing and maintenance charges.

Pakistan: In connection with opening of the New Karachi Fish Wholesale Market, the regulations have been issued and, so far as the

wholesale in the Karachi Area is concerned, no one is permitted to sell or otherwise dispose of fish, fresh, dried or salted except at places designated by the Central Government. Under this regulation only the Karachi Fish Harbour has been designated as the place for disposing of fish.

b. International Trade.

In most countries in the region foreign currency shortages make it necessary to impose comparatively strict regulations on fish imports, while exports are encouraged and in some cases assisted by the governments.

Australia: Fish landed by registered Australian vessels or tenders associated with such vessels are imported duty free. All fish and fish products from other sources, including New Zealand, are liable to duty. The rates of such duty depended on the country of origin and they range, broadly speaking, from one penny to four pence a pound.

Under the customs regulations, licences must be obtained for all imports of fish and fish products. The quantities of fish permitted into the country are regulated in accordance with a definite quota system which reflects overall Government policy with respect to imports of all types of goods. Whenever the level of imports reaches proportions which create anxiety for the future of the domestic producer, a request for increased tariff protection can be made and, if the results of an investigation by the appropriate Commonwealth authority appear to justify such anxiety, changes in import duties can be effected.

It should be noted that at present Australia is dependent on imports of fish and fish products to meet local demand. Approximately forty-five percent of all fish consumed on an edible weight basis is imported.

Fish exports from Australia are uncontrolled, except that fish products produced for export must be processed in an establishment or place which is registered by the Commonwealth under the Export (Fish) Regulations. The registration is designed to cover all aspects of what might be termed processing, i.e. canning, cooking, freezing, packing and storage. All fish and fish

products are subject to inspection by Commonwealth Officers prior to export to determine quality and whether or not the items are up to export standard. The Government provides assistance of a non-financial nature to any Australian who desires to make enquiries regarding overseas markets, availability of supply, etc. Import duties on quantities re-exported are refunded.

Cambodia: The Fresh-Water Fishermen's Cooperative which was set up in 1940 was given by the Government the monopoly to collect and export dried-salted fish. However, this monopoly was withdrawn in 1956 and since then the export business has been entirely left to the individual traders.

Hong Kong: Import quotas are applied to landings of fish by foreign fishing vessels.

Export permits are required by the Co-operative and Marketing Department for statistical purposes.

India: It is reported that import policies of the Government of India change from time to time and that under present regulations no fish in any form is allowed to be imported from any other country except Pakistan. Fresh fish is imported free: salted and unsalted dried fish and fish maws are imported on the issue of licences valid for six months. The Indian Customs Tariff Act specifies duties on imports of various types of fish products.

Imports from Pakistan are duty-free which means, in practice, that no revenue is at present obtained from the collection of duties. No control is exercised at present over import prices and fish are imported entirely at the importer's risk. Exports of fish in any form, except fish seed, are encouraged and licences are issued free of charge by the Ministry of Commerce and Industry, under present policies. No export duties are levied. The volume of export is governed purely by demand and supply and no restrictions or quotas exist at present; in the case of fish meal and fish manure alone, port quotas have been fixed for Bombay, Cochin, Madras, Pondicherry and Calcutta. Export prices of fish are not controlled

but are set by the exporters and importers concerned.

Indonesia: It is reported that, while fish exports are unrestricted, duties are imposed on fish imports (customs duties of 10 percent and certain additional fees are imposed). Import quotas are decided by the Import Planning Service of the Ministry of Commerce, and import prices are controlled by the Bureau for Trade and Currency.

Japan: Fish and fish products are subject to general import regulations. Import duties of 25% are imposed on canned sardine in oil; 10% on salted fish; 15% on dried fish; 10 to 15% on other fish products.

As far as exports of fish and fish products are concerned, the regulations permit dealers of canned fish and frozen tuna to set up joint marketing companies or export associations with a view to controlling export quantities and minimum export prices in order to avoid fluctuation of the quantity exported to certain countries.

Federation of Malaya: Under the Customs Ordinance imports and exports are authorized provided licences are taken out.

Import duties are levied at the rate of 25 percent *ad valorem* on canned fish, sharks' fins and fishmaws. Imports of fresh and dried/salted fish and prawns are duty-free. Imports and import prices are not controlled.

Export duties are levied at the rate of \$1.50 per picul (\$25.00 per ton) on dried/salted fish and at the rate of 10 percent *ad valorem* on dried prawns. Exports of fresh fish and canned fish are duty-free. Exports and export prices are not controlled.

A refund or drawback of seven-eighths of the import duty is allowed by the Comptroller of Customs on such quantities of imports that are re-exported, provided (1) that they are re-exported within one year of importation, (2) that three months' prior notice of the date of re-export is given to the Comptroller of Customs, and (3) that the re-exports are identifiable with original imports.

Pakistan: Import permits have to be obtained from the Chief Controller of Imports and Exports, Government of Pakistan, Karachi, for imports of fish and related products.

There is no import duty on fresh fish. Import duties are imposed on canned fish and shark and cod-liver oil used for medicinal purposes etc. In addition a sales tax is levied. At present the rate of duty is 30 percent, and the sales tax 10 percent, for canned, dry unsalted fish, and cod, shark, halibut and other fish oils. Import ceilings on canned fish and medicinal fish oil are fixed by the Chief Controller of Imports and Exports for time to time.

The Controller of Prices and the Director of Civil Supplies are empowered to fix maximum wholesale and retail prices for the benefit of consumers when shortages of such products as medicinal fish oils are acute. Prices for these products are fixed under the provisions of the "Essential Commodities Act". No specific export restrictions for fresh, frozen, processed or any other fish products are in existence. In general, the exporter must obtain an export permit so that the State Bank of Pakistan is informed of the amount of exchange to be realized from the transaction.

The "Export Incentive Scheme" under which exporters are permitted to utilize 20 to 30 percent of their foreign exchange earnings for the import of such items as they require for their own operations, covers exports of fish and fish products. It has been recommended to the Government that import duties currently levied on packaging material such as tin cans, cartons and labelling material which are imported and re-exported with the products, should be refundable or the materials exempted from duty.

After the projected introduction of the Quality Control Act for dried fish, fish-meal, fish-manure, fish oils, frozen and canned stuffs, these products will have to meet prescribed standards before they can be exported.

Philippines: Import of fish in air tight containers, except for certain species such as mackerel and herring has been controlled.

International traders visas are issued only to nationals of the countries with which the Philippines has trade agreements or specific agreements on this respect. Nationals of the other countries may enter the Philippines as temporary visitors for business.

Thailand: Duties are collected on fish imports. Exports are not controlled, except that export prices for salted fish are established from time to time by the Fish Agents Committee.

IV. FISCAL AND FINANCIAL MEASURES

Although emphasis on financial assistance measures is put on the primary fishing sector, several countries assist also the marketing sector, particularly through fishermen's cooperative associations.

Australia: Government fiscal and financial assistance measures to fish marketing operations are confined, for the most part, to the provision of credit to fishermen's cooperatives. For example, in the State of Victoria, the Rural Finance Cooperation has extended loans to fishery cooperatives for the construction of freezing plants. In addition, certain cooperatives receive a reduction on the commission payable on fish sold at the government central markets. However, this financial benefit is offset by the fact that these cooperatives perform certain operations which are normally functions of the market.

Burma: Exemption from, remission or reduction of taxes is considered in the case of "lease" fisheries in inland waters where the amount of revenue from one fishery is of the order of one to ten thousand Kyats.

Ceylon: One of the purposes for which loans are granted to fishery cooperatives by the Department of Fisheries is for marketing. These loans are repayable in one year. A loan of Rs. 500,000 repayable in five years, was extended to the Ceylon Cooperative Fish Sales Union in 1952. This loan was for the purchase of transport, office and store equipment, structural alterations to buildings, and operating and incidental expenses.

India: Credits for fish marketing operations are usually arranged with private banks or money lenders according to convenience. Cooperative societies can secure loans from the central co-operative banks for production and marketing purposes. The Government also extends assistance to the societies by offering grants and loans with regard to specific schemes. The Government of India also grants loan assistance to the State Governments. Subsidies for marketing purposes are provided for specific schemes during the experimental stage by way of providing the service of officers and other marketing facilities.

In *Maharashtra*, government financial assistance for construction of new fish markets or re-modelling of the old ones is provided to the municipalities and gram panchyats. In *Madras*, the Department of Fisheries provides transport vehicles to fishermen's cooperative societies on a hire-purchase basis. Among the trucks operated for transport of fish to Bombay, twenty-five are owned by fishermen's cooperatives which have purchased them with funds loaned by the Government of *Bombay*.

Japan: The Agriculture, Forestry and Fisheries Finance Corporation extends loans to cooperatives for ice-making, refrigerating and other facilities. The Japan Development Bank as well as the Smaller Enterprises Finance Corporation also provides loans to fishing companies or individual entrepreneurs for the construction of ice-making or refrigerating facilities.

Pakistan: The Pakistan Industrial Finance Corporation and Agriculture Bank extends loans to firms for acquisition and improvement of freezing and ice-making establishments, cold storages, and other facilities.

The Central Board of Revenue, with the previous sanction of the Central Government, has as a special case exempted the articles specified below from the payment of Customs: nylon twine, marine diesel engines, spare parts for marine diesel engines, nylon ropes, coir rope, burma teak, fish hooks (ordinary), sponge floats, navigational instruments, mast wood, lead sinkers, other requirements (miscellaneous), dug-out canoes (fishing tonnies).

The exemption will be subject to the condition that in the case of imports in West Pakistan, the goods are imported through the Karachi Fishermen's Cooperative Purchase and Sales Society Ltd., Karachi and a certificate from the Ministry of Food and Agriculture is produced on the occasion of each import to the effect that the goods will be used exclusively in the fishing industry. This certificate should be produced to the Collector of Customs, Karachi, before exemption is allowed.

In the case of East Pakistan, the goods should be imported through the Director of Fisheries, East Pakistan, who will furnish a certificate on the line stated above to the Collector of Customs, Chittagong, on the occasion of each import before exemption is allowed.

The Central Board of Revenue has also exempted the articles in question from the payment of sales tax leviable thereon, subject to the conditions mentioned above.

Philippines: The Philippine National Bank extends loans to merchants and retailers for operating expenses and to processors for the purchase of facilities and for operating expenses.

The Agricultural Credit and Cooperative Finance Administration (ACCFA) assists fishermen's cooperatives in the acquisition of facilities for handling, storage, processing and packing. ACCFA also grants merchandising loans to the cooperatives for purchasing and processing catches of their member fishermen. ACCFA also makes commodity loans to cooperatives on their stock of raw material and on finished products.

V. TRAINING OF MARKETING PERSONNEL, EXTENSION SERVICES AND PROMOTIONAL ACTIVITIES

Australia: The training of market personnel has been a function of the authority controlling the market, i.e. the cooperative, the municipal or the State authority. There is no scheme, on a Commonwealth or State basis, for the training of market personnel. Very little work has been done to educate consumers. Activities in this field, in general, form part of

the sales promotion work of private entrepreneurs, mostly canners.

No financial assistance has been given by either Commonwealth or State authorities for industry advertising, the cost of such advertising being borne by the producers concerned. Importers of fish and fish products are spending a considerable amount of money, by Australian standards, to advertise their lines.

Hong Kong: Senior staff of the Fish Marketing Organization attend lectures given by cooperative officers on basic principles of cooperation. All cooperative officers, in turn, regularly attend a refresher course conducted by the Department.

No specific arrangements exist for a consumer education program. Such a program is considered somewhat unnecessary as fish is one of the basic foods in the Colony.

India: The Directorate of Agriculture, Marketing and Inspection provides training for personnel responsible for the conduct of surveys of fish and agricultural markets. Employees of cooperatives are trained in the different cooperative training schools in the States. In connection with the execution of marketing schemes, a number of subordinate officers are expected to be trained. When, as is currently planned, the Saurashtra Cooperative Federation is converted into a model cooperative marketing society, particular emphasis will be laid on personnel training. Certain officers who were attached as counterparts to FAO fish marketing experts, had a special opportunity of receiving training in fish marketing operations. Fish marketing, finally, forms part of the syllabus in the Central Inland Fisheries Training Course which trains officers for the expanding Fisheries Department of the States.

Consumers' education takes the form of the organization of special exhibits and film shows and the distribution of pamphlets.

Indonesia: Extension services are limited to the training of managers of fish auctions.

Japan: Executives of fishermen's cooperatives receive training at the Fishermen's Co-

operative Association School which is subsidized by the Government.

Federation of Malaya: Officers of the Department of fisheries are trained in the Cooperative College to enable them render advice and assistance to fishermen in the formation of marketing cooperative societies. Officers of the Department of Cooperatives are detailed to encourage and supervise the cooperative movement in fishing communities. A program of training members of cooperative societies on the east coast in fish marketing, management, fish curing, etc., is now under implementation.

Pakistan: A number of officers and inspectors of the Department of Fisheries have received training in the field of marketing in some countries of South East Asia, U.S.A. and Canada. These officers are expected to take charge of operations in the new wholesale fish markets at Karachi and Pasni. Until now very little has been done in the field of consumer education. The Department of Fisheries has no staff specializing in these activities.

VI. SUPERVISION AND REGULATION OF MARKETING OPERATIONS

a. Auction Market Supervision, Registration and/or Licencing of Wholesalers and/or Retailers

According to the information received, auction operations are in most cases left to the hands of wholesalers, although wholesale markets are owned and administered by governments or municipalities. The following information has been received which indicates different degrees of supervision on wholesale market operations:

Australia: Fish auctions are controlled in Queensland and New South Wales and, to a limited degree, also in Victoria and Western Australia.

Under State law, the registration or licencing of wholesalers and/or retailers is not necessarily a function of the State authority responsible for the control and regulation of fish marketing. In Queensland, the Fish Board has the

power to issue wholesale and retail distributors licences and also hawkers licences. In New South Wales, the Chief, Secretary has the power to licence oyster vendors, whether they sell wholesale or retail. With the exception of these two States, the only controls exercised in the States are the registration of premises to facilitate the operation of State or Municipal Laws relating to hygiene and health.

Burma: There are neither supervision arrangements in auction markets nor registration and/or licence system for wholesalers or retailers.

Ceylon: The Government does not supervise marketing operations. Auctions, in auction sheds maintained by the Roman Catholic Church, are supervised by the Church authorities. All retailers and wholesalers have to obtain licences from local authorities for the use of markets.

Hong Kong: All auction sales at wholesale fish markets are conducted through the agency of the Fish Marketing Organization.

Retailers of fish have to obtain retail permits by the Cooperatives Development Department and all buyers at wholesale fish markets have to be registered by the Fish Marketing Organization.

India: Auction markets have not yet come under the control of the Government, though attempts have been made to introduce regulated markets in some centres. There are no registration or licencing requirements for wholesalers or retailers at present.

Indonesia: Auction markets are not supervised by the Government.

Pakistan: Auctions in the Central Wholesale Markets are closely supervised by the municipal authorities and also by the Ministry of Agriculture and Forestry. Marketing operations at other wholesale markets in landing places as well as in consuming centres are supervised and regulated by the respective Prefectural Governments in accordance with regulations promulgated by these authorities. Consignees in Central Wholesale Markets shall obtain licences from the Minister of Agriculture and Forestry, and

wholesalers from the municipal authorities which administer the Central Wholesale Market. Wholesalers in other wholesale markets under prefectural regulations are also subject to systems of licence or registration.

Federation of Malaya: Wholesalers and retailers in the auction markets in the big centres have to be licensed. Supervision by market authorities is, however, confined to ensuring that the market is kept clean, auction operations being left entirely to the hands of wholesalers.

Pakistan: No detailed information is available concerning organization of auction sales and supervision in the New Karachi Fish Wholesale Market.

Singapore: The wholesale fish dealers in the City Council Markets are licensed by the City Council. All fish auctioneers are also licensed under the Auctioneers' Ordinance by the Government.

All markets in the city areas are controlled by the City Council and all markets in the rural areas are controlled by the Rural Board.

Thailand: Auctioning in Bangkok is under the supervision of the Fish Marketing Organization Auction. Markets outside the Bangkok area are not controlled. Bangkok wholesalers are obliged by law to register at the Department of Fisheries. Wholesalers outside Bangkok must register at the Provincial Government Offices.

b. Quality Grading and Inspection

In many of the countries in the Indo-Pacific Region, inspection from the hygienic viewpoint is carried out. It is noted, however, that quality grading and inspection is enforced mainly for fish products which are exported.

Australia: Regulations of varying scope pertaining to the inspection of fish by health and market officers, to determine quality and suitability for human consumption, are in force in all States. The special quality control measures relating to export products were mentioned above in connection with export measures.

India: Quality grading is not prevalent at present. The only product for which quality standards are being enforced is fish meal intended for export, because of the insistence of importers abroad. As far as domestic trade is concerned no such standard exists for any fishery products.

Japan: Fishery products destined for export, including frozen or canned fish, fish meal, vitamins, agar-agar and pearls, have to be submitted for inspection under a special law seeking to maintain a certain standard of quality. With respect to processed products destined for the domestic market, inspection is provided for under the law of Standardization of Agricultural, Forestry and Fisheries Products, the main purpose of such inspection being grading. All food products including fisheries products are subject to sanitary inspection under the Food Sanitation Law.

Pakistan: Quality grading and inspection regulations for fresh and dry fish were prepared in connection with the opening of a new wholesale fish market at Karachi and these have been under the examination of the Ministry of Agriculture for implementation. Very recently the Government of Pakistan has appointed the Pakistan Standards Institution to look into the question of standardization of all products that are being exported from the country. The question of grading and quality control in respect of fish in all forms is under consideration by this Institution and some preliminary discussions have already been held between the officers of the Fisheries Department, Pakistan Standards Institution and the persons engaged in this industry.

Thailand: Quality grading and inspection is being enforced for exported salted fish. In March 1955, the Government adopted a resolution providing that only salted fish of high standard and good quality be exported, and designated the Department of Fisheries to take over the inspection and certification functions. Specific orders and regulations regarding the inspection and certification of fish were issued on 29 June 1955. The first product covered by the regulations was pedah (salted *Rastrelliger*) exported by sea-going vessels. Salted pedah, shipped by other means of transportation, was exempted from

inspection. Exporters of pedah must declare whether the product is of standard or sub-standard quality and whether it is red (oily) pedah or white (slight oily) pedah.

U.S.A.

Hawaii : regulations concerning perishable foodstuffs require that fish for human consumption must be kept refrigerated or iced until sold and is subject to inspection for spoilage. It is illegal to sell spoiled fish for human consumption. The Board of Health employs fish inspectors who inspect fish offered for sale in retail fish markets and enforces certain standards of freshness which are based on suitability for human consumption.

Burma, Ceylon, Indonesia, Federation of Malaya :

No provisions relating to quality grading and inspection are reported from these countries.

c. Support of Marketing Cooperatives

In most countries in the Region, governments support the organization and activities of fishermen's marketing cooperatives by advisory or supervisory measures.

In the cases of Ceylon, Japan and the Philippines, marketing cooperatives are given preferential tax treatment. No instances, however, of compulsory membership or conferring exclusive rights to market supplies by marketing cooperatives have been reported.

Ceylon : These are no fishery cooperatives which devote themselves exclusively to marketing. There are, however, a number of cooperatives which perform both marketing and credit operations. Assistance in the formation of Fishermen's Cooperative Credit and Sales Societies is given by both the Cooperative and Fisheries Department. The Inspectors of the Extension Branch of the Cooperative Department organize study circles for fishermen interested in the formation of societies, and outline a training program in cooperative principles and practice for these study circles. The activities of registered cooperative societies are supervised by officers of the Cooperative Department, who also attend

to the auditing of society accounts. Fishery cooperatives are exempt from income tax.

Hong Kong : Fish marketing activities are taken over by the Fish Marketing Organization and no fish marketing cooperative societies operate at the moment.

India : The Fisheries Departments, in collaboration with Cooperative Departments, assist in the organization of fish marketing cooperatives with the specific purpose of freeing the fishermen from dependence on middlemen and of marketing the fish through the cooperatives. Special credit facilities in the form of grants and loans are provided by the Fisheries Departments in the initial stage of cooperative marketing and substantial amounts have been allotted in the Second Five-Year Plan for this purpose. Membership in the cooperatives and/or delivery of catches to the cooperative is not compulsory at the present time. It is the policy of the Government of India to develop cooperative marketing democratically without compulsory features. No exclusive rights to market supplies are given to marketing cooperatives at present. The State Fisheries and Cooperative Officers impart a knowledge of cooperative principles and practices to the fishermen in the course of lectures given at the general meeting of the cooperative and in informal talks.

Japan : Cooperatives, as a rule, do not confine their activities exclusively to marketing. Fishery cooperatives, however, are encouraged to carry on marketing operations. The business income tax rate for fishermen's cooperatives is lower than that for commercial firms. The offices, warehouses, and cold storage facilities of cooperatives are exempted from the payment of municipal property taxes. A special tax exemption is also granted under certain conditions to federations of fishery cooperatives under the Law for Consolidation of Federations of Agricultural, Forestry and Fishery Cooperative Associations, where such federations are in financial difficulties.

Federation of Malaya : Assistance, information and supervision are given by the Cooperative Department. Societies, however, have to

train staff of their own. Neither subsidy nor preferential tax treatment are given, but government funds have been made available as loans. As a result, the East Coast Fishermen's Cooperative Transport and Marketing Union has been able to purchase an ice plant and a number of lorries and insulated and covered vans for transport. A number of fishermen's cooperatives have also acquired fish curing sheds. Membership is voluntary and no special or exclusive rights to market supplies are granted to the cooperatives. Training in cooperative principles and practices is given to selected leaders of cooperative movements at monthly meetings and special courses and also at the Malayan Cooperative College.

Pakistan: There are no marketing cooperatives at present. The Department of Fisheries, however, has encouraged the formation of cooperatives by holders of Government-supervised fish stalls, to reduce overhead expenses and lower prices and to enable them to compete more effectively with merchants in the municipal markets and with hawkers. The administration of the Wholesale Fish Market at the Fish Harbour at Karachi has been entrusted to the Karachi Fishermen Cooperative Purchase and Sale Society, Ltd., on a three years experimental basis. The Cooperative Society runs the market under the direct supervision of the officers of the Central Fisheries Department who are specialized in the field of marketing and have received training in this field in various foreign countries.

Philippines: The Agricultural Credit and Cooperative Financing Administration (ACCFA) was created in 1952 to take charge of all governmental activities relating to the promotion, organization, financing and supervision of cooperative associations in rural areas including education in the principles and practices of cooperative production, marketing and credit. The ACCFA is financed with the sum of Pesos 100 million which constitutes its revolving fund for the provision of credit to farmers and small fishermen.

Under the general cooperative law, the cooperatives are exempted from the merchant sales tax, income tax and all other percentage taxes. The initial technical and financial assistance in the establishment of pilot processing

and storage projects is provided wholly at the Government's expense and later on, when found commercially feasible, these installations are handed over as loans to the fishermen's cooperatives.

Thailand: A Central Fishery Cooperative was set up with the support of the Ministry of Cooperatives in 1952. The Cooperative was provided with Bahts 200,000 reserve capital. The main office is located in the same compound as the Bangkok Fish Marketing Organizations. The organization sells the catches of its members by auction.

VII. EFFORTS TO LOWER PROCESSING AND MARKETING COSTS

It has been mentioned before that in most countries governments and municipalities build and own wholesale market places. It has also been mentioned that government loans are often granted particularly to fishermen's cooperatives so that they can acquire processing or marketing facilities. According to the information available, some governments even provide ice plants, cold storage, curing yards, lorries, etc. in order to help the industry to improve the fish marketing and to lower the costs.

Australia: In various States, considerable financial assistance has been given to the industry by Government authorities, either directly or through State banks, to provide processing, transport and storage facilities. Generally speaking, most fishermen's cooperatives have received substantial monetary aid, either by way of loan or grant.

Freight concessions on the transport of fish by Government transport service are made in certain instances.

Except in instances where cold storage facilities are connected with a central market, no special provisions for lowering storage costs are made. The cost of building cold storage facilities owned by cooperatives and private concerns in the industry, however, has been in many cases partially or wholly financed by Government monetary aid.

Ceylon : There is a Government cold storage plant, by-products factory, and machine shop (at Mutwal) operated by the Fisheries Department. This plant commenced operations in 1957. The cold storage plant has a storage capacity of 500 tons and a freezer capacity of 10-12 tons. There are three sharp freezers which are capable of freezing fish at a temperature of -30°F . The storage is -10°F . The plant also produces ice, the capacity being 10 tons of block ice, and 12 tons of flake ice, in 24 hours. A cold room for the storage of dried fish and two chilled water tanks capable of storing 5-6 tons of fish for short-term periods are also available. Facilities also exist for the filleting of fish when required.

The by-products factory, which adjoins the cold storage plant, is equipped for the production of fish meal, dried salt fish produced by the use of a mechanical drier, shark liver oil, and canned fish on an experimental scale.

The machine shop provides servicing and repair facilities for craft, equipment and vehicles of the Fisheries Department. Storage facilities for products and equipment required for the plant and factory, the trawlers and other departmental vessels, and the general supplies of the Department are located in the by-products factory building.

The Department of Fisheries also operates three 5-ton ice plants at Jaffna, Battuluoya and Pesalai, three important fishing centres.

Salt is issued to fish curers at a special reduced rate subsidized by the Government.

Limited facilities are available for the transport of fish in trains run by the Ceylon Government Railway.

Hong Kong : The Government and the Fish Marketing Organization assist the industry in every possible way to encourage and provide facilities for processing, storage, etc. Recently a new reclamation which was completed adjacent to one of the main fish wholesale markets has been reserved entirely for the industry.

As the distances from markets to consumers are relatively short in the Colony and as

locally caught fish are consumed only a short while after landing, the costs of storage and distribution are not of major importance in the industry. The Fish Marketing Organization provides practically all transportation from production areas to wholesale fish markets and from the markets to retailers' place of business.

India : The Central and State Governments established fish-curing yards all along the coast to provide facilities to the fishermen for curing catches hygienically. In addition to free technical advice, curing tanks and drying platforms are furnished and subsidies are given for salt used for curing within the prescribed premises.

Lack of proper transport has always been a serious impediment to the progress of fish marketing in India. Though a few haphazard attempts in this direction had been made before, the recommendations of the FAO Fish Marketing Exports in recent years provided a great impetus for the improvement of fish transport. Efforts are made to run available facilities on an economic basis by choosing profitable routes, converting petrol engines into diesel engines, etc. At present transport vans provided by the Governments are run at subsidized rates.

The chief mode of transport in India today still is the Government railways, which accepts consignments of fresh fish at half parcel rates. This concession does not apply to cured fish. The railways also undertake to transport fish by fast trains. To reduce the time taken for transport of fish from landing to consuming centres, the operation of launch services has been encouraged by the Government and the introduction of carrier launches between Karwar and Bombay, Saurashtra and Bombay, Mettur reservoir in Madras State and in the Chilka lake, Mahanadi estuary in Orissa and Sunderban areas in West Bengal, has greatly helped the fish trade. Some State Governments provide road transport facilities under existing fish marketing schemes.

The Andhra Pradesh Government has provided twelve insulated vans and two carrier boats to the fishermen for the transport of fish to the markets. The steps taken by the Government of Maharashtra to effect speedy transport of fish

are : reservation of sufficient space in brake-vans for loading of fish at important rail-heads, increasing the holding time at loading centres, arranging despatch of fish by fast trains, relaxing quotas for fish parcels at peak seasons and giving priority to fish consignments.

Ice and cold storage plants in fish landing, assembling and consumption centres, constructed under Government auspices, provide facilities for packing and storing fish. Efforts are being made all along to reduce the cost of these services.

For example, the Punjab Government is building five cold storage plants in various parts of the State.

Japan : Fish and fish products are transported by motor trucks and by rail. The greater part of the railway network is managed by the National Railway Corporation which has 3,300 cold-storage vans. However, about 45 percent of the total fish and fish products carried by the railroads is transported by ordinary vans. In certain cases, the National Railway Corporation allows fishery products to be transported at reduced rates.

Low interest loans are extended by the Agriculture, Forestry and Fisheries Financing Corporation to fishery cooperatives for the purpose of constructing refrigerating plants.

Pakistan : A scheme is under consideration for the Government to provide a chain of cold storage facilities throughout the country to reduce the cost of processing and storage. This has also been included in the 2nd Five Year Plan.

Thailand : The Government provides facilities for transport and storage to the industry. Vehicles for transportation are placed under the control of the Fish Marketing Organization to reduce high transportation costs. A 1,200 tons cold storage has been built close to the Bangkok fish wholesale market. Many other small facilities are scheduled to be constructed at strategic points in the provinces in the near future.

VIII. TECHNOLOGICAL RESEARCH

Most governments maintain research laboratories and staff for the purpose of improving product quality, developing new products etc.

It is noted that in the countries such as Australia and Japan, where the fishing industry has developed considerably, the industry is largely responsible for conducting technological research with government assistance.

Australia : There is no organized nationwide research program covering technological improvements. Experiments have been, in the main, carried on privately by the industry. This does not mean, however, that the Government authorities are not aware of the need for research and, in fact, the considerable amount of financial assistance, which has been given in the past, and is being given at present, for these purposes, indicates Government appreciation of the need for effecting improvements in handling facilities, product quality etc.

The Commonwealth Fisheries Division disseminates information to acquaint the interested sections of the Australian industry with details of recent improvements overseas.

Ceylon : Improved and up-to-date methods of unloading, handling, freezing, glazing and storing of fish are used at the Mutwal fisheries factory.

An improved hygienic method of making dried salt fish has been developed in the laboratory. Samples of fish sauce prepared from small fish unsuitable for direct human consumption have also been prepared. Studies have been made in the manufacture of liquid fish meal, smoked fish, and the preparation of hydrolysates from fish liver residues left after the extraction of oil.

India : Technological research for the improvement of facilities and equipment, product quality, packing materials and design, development of by-products and for finding new usages for products is being undertaken in the research institutions operated by the Central and State Fisheries Departments.

Japan : Although technological research is largely conducted by private industry, the Government grants some subsidies and research aid funds to industries and to research workers in universities for the improvement of cold-storage methods, fish solubles, fish containers and cargo handling. As to the improvement of pro-

duct quality, packing materials and designs, and development of by-products, fisheries research laboratories of central and local governments have carried out studies and much has been done by private industries. Fish sausages and smoked squid, which have been introduced recently as the result of these studies, have been readily accepted by consumers.

Federation of Malaya: Experiments have been conducted by the Department of Fisheries on processing various types of fish into fish meal and on assessing the protein contents.

Pakistan: Experiments on canning, drying and handling of fish are being conducted in the Departmental Laboratory on a moderate scale. More extensive work is expected by a biochemist trained in the U.S.A. as soon as the new Department of Fisheries, in collaboration with the railway authorities, has undertaken the transport of fresh fish in refrigerated railroad cars, in special types of fish containers, between Karachi and Lahore stations, on an experimental basis. If the results prove satisfactory, similar transport facilities will be provided for all other major towns in both West and East Pakistan.

Singapore: Technological research is carried out by the Fisheries Department whenever there is a need for it.

Philippines: Technological researches are carried out by the Fisheries Research Division of the Bureau of Fisheries.

Thailand: An FAO expert recently helped the Government to organize a Division to carry on technological work and to establish a technological laboratory.

IX. ECONOMIC RESEARCH

Little has been done in the field of organized economic research as compared with technological research. Activities in various countries are reported as follows:

Australia: The recognition of the need for economic research into fisheries problems is a post World War II development. The nature and extent of economic research presently being conducted is somewhat limited but increased attention is being paid to such work.

Hong Kong: A comprehensive range of statistics kept by the Department together with periodical research work on most phases of the industry provides a clear picture in the Colony of the position of the industry. Periodical analysis of available information in the Colony is sufficient to determine the policies implemented by the Government with regard to the industry, and economic research on a large or elaborate scale is not considered necessary.

India: Three FAO Fish Marketing Experts were successively assigned to India and made market surveys in connection with the operation of pilot market schemes during the period from 1956 to 1959. The work of the experts was concentrated in Madras, Bombay and Mysore States, and recommendations have been made to the Central and State Governments for implementation. The Indian staff trained by these experts are continuing economic research.

Japan: The Fisheries Research Institute, which is sponsored by the fishing industry, has been conducting economic research on various aspects of the fishing industry. While most of the facilities of the Government fisheries laboratories are devoted to technological research, the Government has entrusted the Fisheries Research Institute with economic research, mainly in the fields of marketing and cooperatives, giving the Institute financial assistance.

Federation of Malaya: The Department of Fisheries has conducted short-term investigations on market handlings of fresh fish in two main markets, viz. Kuala Lumpur and Penang. A Malayan-wide survey was also made on the distribution of fresh fish supplies.

Philippines: Economic researches are conducted by the Fisheries Research Division of the Bureau of Fisheries.

Singapore: Marketing surveys have been carried out by the Government from time to time.

Thailand: In 1956, the Fisheries Department with the cooperation of the National Economic Council, ICA, FAO, and the Kasetsart University, carried out the economic survey of the pla-tu (*Rastrelliger*) salting industry in three Provinces where this industry is predominant.

The report was published in 1957. This survey is the first study made by the Fisheries Department, in which economic data were obtained by personal interviews with the people in the industry.

X. MARKETING INTELLIGENCE

Australia: In each State, supply conditions, prices, market receipts, etc. are publicized either directly in daily reports of the authority controlling the market or, alternatively, in the local press. In addition, the Commonwealth Fisheries Newsletter contains a schedule of monthly average prices obtained for fish in four of the main metropolitan markets. The trade press also contains a good deal of marketing information. Due to the prominence of State Governments and fishermen's cooperatives in the marketing of fish in Australia, the need for marketing information on a daily basis is perhaps less acute here than in other fish-producing countries.

Ceylon: The Government Extension Bulletin contains reports on market receipts and prices in Colombo from time to time.

India: No organized marketing intelligence service for the collection and dissemination of information on supply conditions, manufactured products, market receipts or storage holdings, exists. Catch estimates are prepared by central research institutions. Fish price statistics are at present collected in a few important cities. Collection of price data is to be extended to several cities in each State. Recently the Government of Maharashtra has taken steps to collect fish marketing news to be passed on to interested parties. In Uttar Pradesh, the State Fisheries Department collects data on the quantity of fish sent out from the State.

Japan: The Government disseminates information on prices, supply conditions, market receipts etc., through the radio and newspapers. Marketing intelligence is also obtainable from fishery cooperative organizations and fish wholesale companies operating in major wholesale markets in consuming centres. Recently a Government-sponsored corporation has been established, with a view to expanding Government activities in the field of marketing intel-

ligence for agricultural, forestry and fisheries products, mainly through more detailed radio coverage.

Federation of Malaya: For the benefit of fishermen, particularly those on the East Coast who are remote from consuming centres and consequently not so well-informed of market conditions, Radio Malaya makes two broadcasts a week of both wholesale and retail prices of fresh fish and dried/salted fish.

Pakistan: The Department of Fisheries has so far been collecting information on supply conditions of fresh, cured and otherwise processed fish, such as frozen and canned shrimps. Daily wholesale and retail prices of fresh fish are being announced on the radio for the benefit of the public.

Philippines: Available data on marketing conditions are supplied to the public by the Fisheries Research Division of the Bureau of Fisheries.

Thailand: Daily prices of fishery products are made public through the radio and newspapers.

2.2 Fish Transport Organization and Facilities in Selected Fishing Centres in the Indo-Pacific Region.

INTRODUCTION

Table I.

FISHING CENTRES CLOSE TO CONSUMPTION CENTRES, WHERE TRANSPORT IS NOT A DIFFICULT PROBLEM
NOTES ON TABLE I.

Table II.

FISHING CENTRES WITH ADEQUATE TRANSPORT FACILITIES FOR PRESENT LANDINGS
NOTES ON TABLE II.

Table III.

FISHING CENTRES WHERE TRANSPORT FACILITIES ARE NOT ADEQUATE AND A MAJOR PART OF CATCH PROCESSED
NOTE ON TABLE III.

INTRODUCTION

By the IPFC questionnaire, "A Review of Fish Transport Organization and Facilities in Selected Fishing Centres of the Indo-Pacific Region" member countries in the Region have been asked to prepare reports on the fish transport situation concerning selected fishing centres in the respective countries.

Replies have so far been received from Australia, Hong Kong, India, Japan, the Federation of Malaya, the Netherlands, the Philippines and the U.S.A., and they include reports on some 23 selected fishing centres.

Although a full appraisal of the present situation of fish transport facilities concerning a given landing centre would hardly be possible unless more detailed information is available on various technical, economic and social factors concerning fish production, transport, processing, storage, consumption etc., the reports appear to indicate that adequacy of fish transport facilities is, in the first instance, of a comparative nature and should be considered in the light of a number of geographical, economic, technical and social factors with respect to the given fishing centres. These factors include: volume of landing with due consideration to seasonal concentration and catch fluctuation, concentrated or scattered landing centres along coast lines, distance from consumption centres, prevailing methods of fish disposition, availability of storage and processing facilities etc. The level of development of the general transport facilities including railways, roads and boats should of course be taken into account. For example, certain fish transport facilities which are considered satisfactory for the present for one fishing centre where a comparatively small amount of catch is landed or which is close to consumption centres would be totally inadequate for another centre where a large volume of catch is landed and the distance to consumption centres is considerable.

On the other hand, it is very likely that in some instances the present level of development of transport facilities limits the potential fish production and consumption, though the centre appears to encounter little difficulty for the present facilities are considered sufficient simply because the bulk of the catches are processed and shipped later on to distant markets. This may be a result of insufficiency of the increase of fishermen's earnings, thus giving no incentive to them for

increased production. In those cases, therefore, a statement that the present facilities are adequate will not be sufficient and often misleading. Although this report deals mainly with factual information and it is not possible to go into these aspects, further investigation would be required in order to decide on measures of improvement so that an increase of fish production and consumption may be brought about.

This report classifies the selected fishing centres on which information has been made available in the following three categories:

1. *Fishing centres which are close to consuming centres and therefore fish transport does not constitute a particularly difficult problem:*

Hong Kong; Pondichery, Karikal, and Yanam of the Pondicherry State, India; Humboldt in Netherlands New Guinea; Orion, Nasugbu, St. Cruz and Rosario in the Philippines; Honolulu in Hawaii.

2. *Fishing centres where adequate transport facilities are available for the present level of landings for shipping to distant or intermediate markets:*

Ulladulla and Eden in Australia; Shimomoseka, Yaizu and Kesenuma in Japan; Pangkor Island, Pulau Ketam and Mersing in the Federation of Malaya; Lahului and Hilo in Hawaii.

3. *Fishing centres where transport facilities are not adequate and a major part of the catch has to be processed for later shipment:*

Mahe in Pondicherry State, India; Kuala Trengganu, Federation of Malaya; Geelvinkbaai area in Netherlands New Guinea.

Summary tables prepared on the basis of available information are given below according to the grouping as above. Difficulties and problems encountered in the respective centres are also given, as far as the information is available, in the notes following the respective tables.

For some centres there are inconsistencies in the figures but it has not been possible to correct these or to give sufficient explanations. Nevertheless it is hoped that these tables will give a general picture of the movement of fish to various markets, whether local, intermediate or distant.

FISHING CENTRES CLOSE TO CONSUMPTION CENTRES WHERE TRANSPORT IS NOT A DIFFICULT PROBLEM

Fishing Centres	Total Catch and Value (metric tons and national currency)	Main Fishing Season	Local Market		Intermediate Market		Distant Market		Remarks
			Quantity (metric tons) Total: A: consumed fresh B: processed for local consumption C: processed for onward shipment	Transport Means	Quantity (metric tons) Total: A: consumed fresh B: consumed in processed form	Transport Means	Quantity (metric tons) Total: A: consumed fresh B: consumed in processed form	Transport Means	
Hongkong¹⁾	50,300 ²⁾ (H.K.\$55,617,724) April	September-	Total: 50,300 Boats, lorries A: 44,900 tricycles ⁴⁾ B: 5,000 C: 400 ³⁾		—	—	400 ³⁾		5)
India									
Pondicherry	180 (Rs. 7,964)	February- September	Total: 135 A: 67.5 B: 67.5	Headloads, ⁶⁾ cycles, rik- shaws, buses	—	—	Total: 45 A: 10 B: 35		7)
Karikal	170 (Rs. 7,616)	February- September	Total: 128 A: 64 B: 64	Headloads, ⁶⁾ cycles, rik shaws, buses	—	—	Total: 42 A: 12 B: 30		7)
Yanam	120 (Rs. 5,376)	February- September	Total: 90 A: 45 B: 45	Headloads only	—	—	Total: 30 A: 10 B: 20		
Netherlands									
New Guinea	30 (F. 52,500)		Total: 30 ⁸⁾ A: 30	Small trucks, jeeps	—	—			
Humboldt- Totefabaii									
Philippines									
Orion, Bataan ⁹⁾	360	dark face of moon	Total: 120 A: 120	Trucks, jeep- neys ^{10a)} horse- drawn carts, headloads	Total: 240 A: 240	Open trucks ^{10b)} (in bamboo baskets, iced)	11)	12)	
Nasugbu, ¹³⁾ Batangas	342	dark face of moon	Total: 76.8 A: 72 B: 4.8	(same as above)	Total: 355.2 A: 348 B: 7.2	(same as above)	11)	12)	
St. Cruz, ¹⁴⁾ Laguna	48 ¹⁵⁾	year round	Total: 48 A: 48	(same as above)	—	—	11)	12)	
Rosario, ¹⁶⁾ Cavite	1,900	dark face of moon	Total: 560 A: 95 B: 14 C: 451	Open trucks, A: 1,187 (in bamboo B: 415 baskets, iced)			11)	12)	
U.S.A.									
Honolulu Hawaii	5,500 (\$2,303,000)	April- October	Total: 5,500 A: 2,420 B: 1,180 C: 1,900	Unrefrigerated ¹⁷⁾ trucks, trucks with refrigerated insulated box			Total: 1,900 B: 1,900	Regular water borne freight	221

NOTES ON TABLE I

Hong Kong :

1) Owing to its size and the location of the five wholesale fish markets, the problems of transportation in Hong Kong, in relation to fish marketing, are negligible. The distances between fishing villages and wholesale markets and between wholesale markets and areas of consumption all lie well within the meaning of the term "Local Market" given in the questionnaire. Travelling time from more remote fishing villages to wholesale markets ranges from less than an hour to slightly over two hours and the transportation in these cases is mainly carried out by transport vessels operated by the Fish Marketing Organization. The travelling time between the wholesale markets and the consumer areas (mainly the urban areas of Kowloon and Hong Kong) is virtually a matter of minutes. Consequently the questionnaire has been taken for Hong Kong as a whole and no details are given for each wholesale market.

2) Catch in 1959.

3) Processed for export.

4) Well over 90% of all marine fish sold in wholesale markets in the Colony were landed directly by fishing vessels or transported by marine transport provided by the Fish Marketing Organization. After sales at wholesale markets, the fish is mainly carried in 3 or 4½ ton lorries to retail outlets. In a few markets, situated in or near urban areas, some fish is removed by retailers themselves on tricycles or small vans.

5) The transportation services in Hong Kong are adequate and meet the needs of both fishermen and retailers. Adequate numbers of vehicles are available, roads are good and distances are relatively short. Consequently, no particular scheme is in operation for the improvement of transportation facilities other than

a regular and continuous watch being kept on the economical and efficient use of existing facilities.

India :

6) Fifty percent is transported by head-loads.

7) A motor van will be made available by the State to fishermen's cooperatives under the Second Five Year Plan.

Netherlands New Guinea :

8) The main market is Hollandia.

Philippines :

9) One hundred and thirty kilometers from Manila.

10a) Army jeeps converted into service and passenger vehicles.

10b) Each basket when filled weighs 15-20 kilograms. Fish is transported to intermediate markets (neighbouring towns involving not more than two hours ride in open trucks). There are no insulated or refrigerated trucks.

The selected centre is not along the railway route so this form of transport is not utilized.

11) The selected centres, or any other fish landing centre, do not market fresh marine fish to 'distant' markets. However, many fishing vessels whose home bases are centres away from 'distant' markets usually land their catch to places near these markets. For example, some fishing vessels are based somewhere in the southern islands. These vessels unload their catch in Manila or Navotas, a landing place very near Manila.

Fresh water and/or brackish water fish (*Chanos chanos*) and marine crustaceans are transported to Manila by railway, boat and plane from places where Manila cannot be reached by

transports used for intermediate markets. These are usually alive or directly iced. Processed fish (smoked or dried) are transported by railway and boat.

Fresh and processed fish transported to Manila as a 'distant' market averages up to a monthly total of 50 tons by railway, 100 tons by boat and 5 tons by plane.

Fish are readily disposed of in local and intermediate markets and the quantity of fish transported to 'distant' markets when compared to the former is insignificant. Facilities may not be modern because conditions do not yet warrant the need for refrigerated trucks or vans.

12) Motor-powered dug-outs are the most commonly used among water-borne transports for intermediate markets. This does not apply to the four selected centres but this mode of transportation is found in the southern part of

the country. The fish may be iced or not depending on whether the freshness of the fish is estimated to last until the fish reach the consumers.

13) One hundred and two kilometers from Manila.

14) Ninety-five kilometers from Manila.

15) Fresh-water fish.

16) Thirty-seven kilometers from Manila.

U.S.A.

17) From vessel to fish auction floor or cannery, transportation is entirely by unrefrigerated and mechanical means, either by large trucks or fork-lifts.

Fish peddlers transport their products to city and outlying districts in small converted trucks with insulated boxes which are refrigerated either by ice or mechanical means.

TABLE II
FISHING CENTRES WITH ADEQUATE TRANSPORT FACILITIES FOR PRESENT LANDINGS

Fishing Centres	Total Catch and Value (metric tons and national currency)	Main Fishing Season	Local Market		Intermediate Market		Distant Market		Remarks
			Quantity (metric tons) Total: A-consumed fresh B-processed for local consumption C-processed for onward shipment	Transport Means	Quantity (metric tons) Total: A-consumed fresh B-processed in processed form	Transport Means	Quantity (metric tons) Total: A-consumed fresh B-consumed in processed form	Transport Means	
Australia¹⁾ Ulladulla, N.S.W.	711 (£A. 120,900)	Flat-head: Oct.-March Morwong: May-Oct. Tuna: Sept.-Dec.	Only very small amount		Total: 711 A: 711	Trucks ²⁾ (in boxes with ice)	—		
Eden, N.S.W.	2,145 (£A. 213,150)	Besides the above, Australian salmon: Apr.-Jul.; Oct.-Jan.	Total: 1,375 A: 95 C: 1,280		Total: 770 A: 770	Trucks, ³⁾ (in boxes with ice)	4)		5)
Japan⁶⁾ Shimonoseki ⁷⁾	230,885 ⁸⁾ (Y. 11,453 million)		Total: 56,800 ⁹⁾	Trucks	Total: 15,900 A: 15,900	Mainly trucks (with ice)	Total: 158,200 ¹⁰⁾ A: 158,200	Railroad vans, trucks, boats	11)
Yaizu¹²⁾	107,298 ¹³⁾ (Y 7,569 million)		Total: 58,161 A: 10,689 ¹⁴⁾ C: 47,472 ¹⁵⁾	Trucks	Total: 5,555 A: 4,154 Bait: 1,401	Trucks (with ice)	Total: 43,587 A: 15,586 B: 28,001	Railroad vans, trucks	16)
Kesennuma¹⁷⁾	65,266 ¹⁸⁾ (Y. 3,225 million)		Total: 12,926 A: 7,057 B: 1,000 C: 4,869 ¹⁹⁾	Trucks	Total: 10,288 ²⁰⁾	Trucks ²¹⁾ railroad vans	Total: 42,052 A: 32,000 B: 10,052	Railroad vans, trucks	22)

Malaya, Fed. of Pangkor Island Perak	18,560 (\$3.5 million)	April-July Oct.-Nov.	Total: 1,060 A: 1,000 B: 60	Boats, ²³⁾ trucks bicycles	Total: 7,000 A: 5,000 B: 2,960	Open trucks ²⁴⁾ (with ice) Boats	Total: 7,500 A: 3,900 B: 3,600	Boat, open trucks	25)
Pulan Ketam, Selangor	9,400 (\$5.9 million)	March- August	Total: 1,800 A: 3-4 B: 1,800		Total: 7,460 A: 4,500 B: 2,960	Boats ²⁶⁾ Trucks (with ice)	—	—	27)
Mersing, Johore	5,180 (\$2.8 million)	May-October	Total: 500 A: 140 B: 10 C: 350	Bicycles, portage	Total: 1,590 A: 1,380 B: 210	Trucks (with ice)	Total: 3,300	Truck ²⁸⁾	29)
U.S.A. Kahului, Maalaea and Kihei, Maui, Hawaii	480 ³⁰⁾ (U.S. \$139,000)	April-Oct.	Total: 335 A: 335	Trucks	—	—	Total: 145 A: 145	Air- ³¹⁾ freight Boats	32)
Hilo, Hawaii	1,065 (U.S. \$405,000)	April-Oct.	Total: 316 A: 316	Trucks ³³⁾	—	—	Total: 749 A: 749	Barge ³⁴⁾ Air- freight	32)

NOTES ON TABLE II

Australia :

1) Comments by the Department of Territories, Australia: Generally, in coastal areas of Papua and New Guinea, a large part of the fish caught is used fresh or lightly smoked, and the quantity used for local consumption would be usually in excess of 80% of the catch. Transport in the Territory is by canoes; fish transported by other methods is negligible, although a small quantity is carried from the larger rivers inland in areas where there are few roads.

In the more advanced areas the situation is improving rapidly and considerable skill is shown by local fishermen in handling gluts of fish, etc. Private organizations are still not very heavily committed in the industry, but the Administration is giving much assistance.

Improvements in preservation by longer smoking and the construction of more efficient smoke houses are in hand. Use of ice is being encouraged to enable fish to be kept for a week or more, and assistance is being given to those organizations which are installing refrigeration.

2) Total landings in Ulladulla are conveyed to Sydney for sale at the Sydney Fish Markets. The fish are packed in boxes with ice and transported by motor truck to Sydney, a distance of 145 miles.

3) Fish was transported by truck to Sydney for sale through the Sydney Fish Markets. The fish are packed in boxes with ice and usually transported the 320 miles to Sydney, overnight.

4) The only fish landed at Eden which would come under this category would be tuna and Australian salmon. These fish are canned in Eden. The canned product is transported to Sydney by road and then distributed to retail outlets by rail.

5) Investigations relating to the handling, storage and method of transporting fish are at present being contemplated in several Australian States.

Japan :

6) Road networks throughout the country are not very satisfactory but have been expanding under the Multiple Purpose Land Development Law and the Road Public Corporation Law.

Of the whole volume of fishery products now being transported by railroad goods vans, 55 percent is carried by refrigerated vans. Under the present national plan for increasing refrigerated vans, much improvement in transport of fish is expected in the near future.

7) Yamaguchi Prefecture, Western part of Japan. Centre for trawl fisheries.

8) Figures for 1957.

9) Fish used for processing purposes are also included. A large portion of the landings was used for processing in and out of the prefecture. In 1957, 14,700 tons of fish were consumed for manufacturing canned products and sausage.

10) Figures for processed form not available.

11) By ordinary railroad goods vans or refrigerated vans: 132,900 metric tons. By private chartered boats 3,100 metric tons. Long-distance truck transport, with ice: 22,200 metric tons (mostly with no insulation or refrigeration facilities).

12) Shizuoka Prefecture. Fishing centre for tuna and skipjack fisheries.

13) Figures for 1958.

14) Fresh 6,590 tons, frozen 4,099 tons.

15) For export: frozen 17,395 tons, canned 30,077 tons.

16) About 60 per cent of the total volume was transported by ordinary covered railroad vans or refrigerated vans.

About 40 per cent of the long distance transport was made by refrigerated or ordinary covered trucks.

17) Iwate Prefecture. Centre for saury, tuna and drag-net fishing.

18) Figures for 1956.

19) For export.

20) The proportions of fresh or processed form are not available, but is thought that the volume of the former is sizable.

21) About 20 percent of the landings was transported by railways vans, and the rest by trucks of various types.

22) About 85 percent by railway vans. About 15 percent by trucks of various types.

Federation of Malaya :

23) By boat from the island to the mainland and then by medium-sized trucks and bicycles; by bicycles within the island.

24) Water-borne transport, private charter from island to mainland. Fresh fish is iced and boxed on the island. Boiled fish is transported in the split bamboo baskets in which it is boiled. Salted dried fish transported in split bamboo baskets.

25) Existing facilities for fish transport are fully exploited and existing roads and vehicles for fish transport are considered adequate.

Warehousing and storage are generally adequate for the transport and disposal of fish at present utilization ratios. Boiled fish is sometimes held in cold storage which may not be adequate in times of glut. However, the problem in this centre is the fact that the bulk of the landings is ikan kembong (*Rastrelliger* spp.) from purse seines, and the landings vary from nothing to 300 tons on any one day. Normally surplus fish over and above demand is salted and dried. The traditional overseas markets (Indonesia) for salted dried *Rastrelliger* are now rarely open. Since the Malayan market for this form of processed *Rastrelliger* is a small one, the alternatives appear to be :

a) fermented product (similar to "Nam Pla" in Thailand) for which again there is little Malayan demand, or

b) quick freezing.

While alternative (b) is thought to offer a better alternative catch utilization there are

difficulties stemming mainly from the uneven supply throughout the year. As far as transport of frozen fish is concerned there are presently no refrigerated trucks available. These would be in use on a one way haul basis. Economic incentive is thus lacking.

However, at present investigations are being conducted into the possibilities of changing the utilization of surplus catches by quick freezing instead or salting and drying. The economic difficulties are outlined above.

26) All fish are transported from the production centre by regular water-borne services to the mainland and then by lorries to intermediate markets. Fresh fish are iced and packed in wooden boxes. Processed fish are packed in split bamboo baskets.

27) Facilities by means of water-borne transport from the production centre to the mainland are adequate.

Transportation by means of lorries from landing point to intermediate markets are adequate at the present level of production.

Rail facilities are not used due to inconvenient time schedules and uneconomic handling.

28) Road transport by means of 5 ton lorries—no insulation or refrigeration.

29) Water-borne transport service is available, but not used at present because of high costs and greater risks.

The greatest use is now being made of the available lorry transports which are considered adequate.

The production centre is already linked by main roads with the intermediate and distant markets.

Warehousing and storage are not necessary.

The Government plans to form a Co-operative Marketing Society at the production centre which will also provide a transport service.

U.S.A.

30) An additional 640 tons of skipjack were transported directly to the cannery by the Maui fishing vessels in order to reduce shipping expenses and this accounts for the dip in the summer landings at Maui.

31) Shipped to Oahu: 128 tons of skipjack by air freight. Five tons of fresh "table" fish (estimated at 200 pounds per week) by air freight. Eleven tons of skipjack by inter-island ferry, which was terminated some time in 1959.

By ferry, fish was iced and shipped in non-insulated metal containers.

Through regular freight service, fish is shipped unrefrigerated and reaches destination between $\frac{1}{2}$ to 1 hours. Fish is claimed immediately or is held under refrigeration at terminal until claimed; both chill and freezer boxes are available at terminal.

Regular barge service available but not used because of the lack of large insulated containers, which are available to and used by the Hilo, Hawaii centre.

Refrigerated motor vans, which can be transported directly on barges, are not used presently. However, this mode of transportation is expected to be utilized in the near future to compensate for the loss of the inter-island ferry services.

32) The tuna cannery has installed refrigerated holding facilities so that quantities of

cannery fish may be held and handled in fewer shipments. The prospects of improvements for the shipment of fresh "table" fish, however, are poor because of the limited marketing situation on Oahu, where fresh fish are bought by consumers within a day of auction.

Marketing and transportation problems are essentially the concern of private enterprise. However, if the often discussed inter-island ferry system for passengers and freight, sponsored by the local government, is realized then some of the transportation problems should be alleviated.

33) Fish peddlers transport the products to city and outlying districts in small converted trucks with insulated boxes which are refrigerated either by ice or mechanical means.

34) Seven hundred and twenty-nine tons of skipjack by barge, 20 tons of fresh "table" fish by air freight.

In regular barge service fish is iced and shipped in insulated metal containers. Through regular freight service, fish is shipped in unrefrigerated paper cartons and reaches its destination between 1 to $1\frac{1}{2}$ hours. Fish is held under refrigeration until claimed. Refrigerated motor vans available but probably not warranted for use with the existing facilities and volume of catch. Vans may be used as a substitute for transporting cannery fish but probably not satisfactory for transporting fresh "table" fish, which has a relatively short saleable period.

TABLE III
FISHING CENTRES WHERE TRANSPORT FACILITIES ARE NOT ADEQUATE AND
A MAJOR PART OF THE CATCH IS PROCESSED

Fishing Centres	Total Catch and Value (metric tons and national currency)	Main Fishing Season	Local Market		Intermediate Market		Distant Market		Remarks
			Quantity (metric tons) Total: A-consumed fresh B-processed for local consumption C-processed for onward shipment	Transport Means	Quantity (metric tons) Total: A-Consumed fresh B-consumed in processed form	Transport Means	Quantity (metric tons) Total: A-consumed fresh B-consumed in processed form	Transport Means	
Malaya, Fed. of									
Kuala Trengganu ¹⁾	5,900 (\$3 million)	April-Sept.	Total: 4,770 A: 150 B: 20 C: 4,600	Bicycles, vans, small lorries	Total: 7602) A: 690 B: 70	Vans, ³⁾ lorries	Total: 2,5704) A: 370 B: 2,200	Lorries75% Boats25%	5) 6)
India									
Mahe, Pondicherry St.	3,350 (Rs. 60,480)	Sept.-May	Total: 838 A: 419 B: 419	Only headloads	—	—	Total: 2,512 A: 1,256 B: 1,256	Railroads, lorries	
Netherlands									
New Guinea Geelvinkbaai Area	100		—	—	—	—	Total: 1007) Boats, airfreight	8)	

NOTES ON TABLE III

Federation of Malaya :

1) Kuala Trengganu might be classified under Table II as well. However, in the light of the large quantity shipped to distant markets in processed form and of the apparent lack of feeder roads and storage facilities, the Centre has been put under Table III.

2) Shipped to markets in Kelantan.

3) There is no railway service and water-borne transport. Except for the insulated vans operated by the Co-operative Union, all the vehicles are not insulated.

4) Shipped to Kuala Lumpur and Singapore.

5) There is no rail service from Kuala Trengganu. No special vans are used and the lorries are not insulated. The transport of processed fish by sea is by the regular services of the Straits Steamship boats.

6) The problem is that there is no central fish-landing place for first sale of fish brought in by fishermen and storage facilities are unavailable.

Another main difficulty is that most of the transport operators, who are also fish dealers, serve special areas and certain classes of consumers only.

Netherlands New Guinea

7) Apparently almost all landings are processed (salted) and shipped to Hollandia, Biak, Manokwari and inland places.

8) The Government has drawn up a plan to reduce the production of processed fish of the fishing centres of the Geelvinkbaai through transporting fresh fish to municipal centres. At the fishing centres freezing units will be installed.

2.3 Government Departments Concerned with Fish Marketing, their Personnel and Training Facilities in the Indo-Pacific Region

- I. INTRODUCTION
- II. GOVERNMENT DEPARTMENTS CARRYING RESPONSIBILITY FOR FISH MARKETING AND THE NATURE OF THEIR DUTIES
- III. QUALIFICATIONS OF PERSONNEL AND TRAINING FACILITIES
- IV. PLANS FOR INCREASING OR STRENGTHENING GOVERNMENT FISH MARKETING PERSONNEL
- V. TRAINING OF PERSONNEL ENGAGED COMMERCIALY IN FISH MARKETING
- VI. TRAINING FACILITIES PROVIDED BY INTERNATIONAL ORGANIZATIONS

I. INTRODUCTION

At its Eighth Session held in Colombo in 1958, the IPFC recommended a "Survey of the requirements of trained personnel, availability of such personnel and of training facilities in the field of fish marketing in the countries of the Region".

Accordingly, a questionnaire was prepared and circulated to members of the Fish Marketing Sub-Committee and of Panel C, Technical Committee II.

This report has been prepared on the basis of the replies received from Australia, Hong Kong, India, Japan, Federation of Malaya, the Netherlands, the Philippines, Thailand and the U.S.A. Other available information has also been incorporated.

Although the replies do not cover the region as a whole, they suggest that in the majority of cases, Governments rely on pre-recruitment qualifications and/or in-service experience rather than on special, formal arrangements for training in fish-marketing subjects. While some useful

information has been assembled concerning the duties and qualifications of personnel the review does little to examine the need for trained personnel, in terms of number and qualifications and in relation to the different activities undertaken by governments for the supervision and improvement of fish-marketing operations. There is very little information on the need for qualified personnel for the conduct of two types of service of outstanding importance in the region viz. a) management of government-sponsored fish-marketing schemes of a quasi-commercial character (including cooperative in many cases) and b) extension work among fish processors and traders.

It should be considered, therefore, whether it would be very useful to continue the assembly of information in its present form and whether it would not be more useful to review in more detail the need for trained personnel, taking as a basis the various activities included in current fish-marketing programs and, in respect of each of these, the number of personnel required, ideally, and the qualifications and training which would be most appropriate for each type of work. This would at least provide some kind of yardstick by which to evaluate the present situation and would be useful from the standpoint of planning future recruitment and training.

II. GOVERNMENT DEPARTMENTS CARRYING RESPONSIBILITY FOR FISH MARKETING AND THE NATURE OF THEIR DUTIES

Australia: Although the *Fisheries Division of the Department of Primary Industry* is responsible for fishery matters in general in the Commonwealth, State Governments are primarily responsible for matters concerning the marketing of fresh fish.

New South Wales: the *Chief Secretary's Department* controls the Sydney Fish Market which is owned by the Municipal authorities and through which the bulk of the catch is sold. Loans are extended to the fishing industry from the Fish Marketing Reserve Fund by the Chief Secretary's Office. There are about 36 inspectors under the Superintendent of Fisheries.

Queensland: The *Fish Board* controls all marketing and in addition to the main Brisbane market regulates the sale of fish through 25 coastal centres.

South Australia: the *Fisheries and Game Department* is responsible for fishery matters including fish marketing.

Tasmania: the *Chief Inspector of Fisheries, Department of Agriculture*, is responsible for fishery matters including fish marketing.

Victoria: the Melbourne Market is owned and controlled by the City of Melbourne and operated by the *Municipal Council*. The *Department of Fisheries and Wildlife* is now a separate Department and deals with fisheries matters.

Western Australia: the Fisheries Department is responsible for fishery matters including fish marketing. The Perth Market and the Fremantle Market are owned and supervised by the Government.

Burma: Two Ministries are concerned with fish marketing:

(a) *Ministry of Cooperative and Commodity Distribution*

The Deputy Registrar, Fisheries, Cooperative Societies Department in the Ministry, is responsible for the development of cooperative fish marketing.

(b) *Ministry of Agriculture and Forests*

The Fisheries Division, Agricultural and Rural Development Corporation under the Ministry, is responsible for the development of fish marketing in connection with increased fish production.

India: The Government of India has one Deputy Director (Fish Marketing) in the *Fisheries Division of the Food and Agriculture Ministry* and his main duties are to organize pilot fish marketing projects, to carry out market surveys for formulation of marketing schemes and to coordinate fish marketing activities on an inter-state level.

The Directorate of Marketing and Inspection of the Government of India also conducts market surveys on an all India basis, including fish markets.

State Governments: Apart from the above, fish marketing is a State responsibility and the *State Fisheries Departments* are chiefly concerned with it. Many fish markets are maintained by the local bodies, i.e. municipalities, panchayets, etc., and cleanliness is maintained by the public health staff who also have the power to exercise control over the quality of fish brought to the markets. The *Cooperative Departments* of the State Governments are concerned with co-operative fish marketing societies. The *Cooperative Departments* provide auditing staff and exercise control over the financial aspects of the societies, the general administrative control being vested with the Fisheries Departments.

Bombay: The following three Departments are responsible for fish marketing:

- (a) *Department of Fisheries,*
- (b) *Department of Industries and Co-operation,*
- (c) *Local Self-Government and Public Health Department.* The latter controls local bodies such as village panchayets, municipalities and municipal corporations which maintain and supervise fish markets. It is concerned with the granting of financial assistance to those local bodies, preparation of regulations regarding sanitation.

Madras: The *Department of Fisheries,* the *Department of Local Administration* and the *Department of Public Health* are responsible for fish marketing.

Indonesia: The *Cooperative Service* is responsible for the supervision and control of fish marketing cooperatives. The responsibility includes assistance information, provision of credit

facilities, support through exemption from trade tax during the first five years, issuance of incorporation acts, etc.

The *Sea Fisheries Service* is concerned with technical aspects of fish marketing, e.g. organizing fish auctions, research and technological improvements.

Japan: In the *Ministry of Agriculture and Forestry*, two departments are concerned with fish marketing. As far as the central wholesale markets in 16 major consuming cities are concerned, the *Agriculture and Forestry Economics Bureau* is responsible for their supervision and control under the Central Wholesale Market Law. Every central wholesale market deals with vegetables and fruits as well as fish, all of which are perishables and regulated under the same regulations.

The *Fisheries Agency of the Ministry of Agriculture and Forestry* is concerned with every aspect of fish marketing except the central wholesale markets as mentioned above. The responsibilities include, among other things, general supervision of fish markets, promotion and improvement of distribution and consumption of fish products.

Fisheries Divisions or Fisheries Branches of Prefectural Governments are primarily responsible for fish marketing in respective prefectures under the general supervision and guidance of the Fisheries Agency.

Federation of Malaya: Government activities concerning fish marketing have been concentrated on the East Coast and two departments are mainly concerned with fish marketing, namely:

- (a) the *Department of Cooperative Development,*
- (b) the *Fisheries Department.*

Both Departments are jointly concerned with the assembly and analysis of fish marketing information, extension and technical advice, and financial aid schemes. The Department of Cooperative Development exercises supervision over the fish marketing cooperative societies

numbering 48 in all. There is no consumer education scheme except for a limited number of broadcasts by Radio Malaya sponsored by the *Department of Information*.

The *Department of Cooperative Development* has two Regional Offices on the East Coast with one Senior Cooperative Marketing Officer assisted by two Cooperative Marketing Officers and 15 Cooperative Inspectors. The Fisheries Department also has two Regional Offices on the East Coast. The staff consists of two Fisheries Administrative Officers who are assisted by nine Fisheries Assistants.

Pakistan: The *Central Fisheries Department, Government of Pakistan*, is situated in Karachi and the Directors of Fisheries in the two Provinces, namely in Dacca, East Pakistan, and in Lahore, West Pakistan, are responsible for general supervision in respect of fish handling, transport, quality control, etc. in respective areas.

The *Cooperation and Marketing Department of the Government of Pakistan*, Karachi, collects data with respect to landing, prices and customs tariffs through Central and Provincial Fisheries Departments, and publishes Market Bulletins on agricultural and fishery products.

Singapore: The responsibility for fish marketing lies with the *City Council* and the *Rural Board*.

Philippines: The *Bureau of Fisheries* is responsible for fish marketing but with the present conditions within the country where marketing activities are in the hands of fishermen and fish merchants, and fish markets are owned by municipal (local) governments or private merchants, the Bureau for the present confines its activities to studies and research on the economics of marketing for the guidance of the general public as well as of the authorities.

Thailand: The *Department of Fisheries of the Ministry of Agriculture* is responsible for fish marketing in cooperation with the *Fish Marketing Organization*, Bangkok.

Hong Kong: With respect to wholesale marketing, the *Cooperative Development Depart-*

ment is responsible for the administration of the *Fish Marketing Organization* which has been established in order to provide orderly wholesale fish marketing and transport facilities. So far as retail marketing is concerned, the regulation and supervision of all retail markets is undertaken by the *Urban Services Department of the Hong Kong Government*.

U.S.A. (Hawaii): The *State Board of Health*, Honolulu, is concerned with fish marketing. The Board has three major health centres located on the island, which is divided into: a) an area which includes the fishery canning industry, the fish docks and fishing vessels; b) an area which includes the wholesale meat and fish markets and establishments relating fish and other meat products in the city; and c) the third area which concerns all establishments in the rural area, outside of the city, and also covers the fish, meat and vegetable peddlers.

The duties of officers (sanitarians) are concerned with environmental sanitation inspection work relating to all environmental sanitation programs and include the inspection of food establishments and working establishments, such as inspecting vegetable farms, slaughter houses, restaurants, fish markets etc.

III. QUALIFICATIONS OF PERSONNEL AND TRAINING FACILITIES

Although the information is limited in this respect, it appears that very few countries have established rigid qualifications for the posts of fish marketing personnel and, generally speaking, the pre-service training required ranges over a wide field of related science including fish biology, fish technology, economics and commerce. Only in Hong Kong, India, the Federation of Malaya, and the United States (Hawaii), in-service training of marketing personnel is conducted in some form or another, while almost all countries have utilized training facilities provided by international organizations such as FAO.

In the cases of Australia and Japan, foreign fellowship holders have been received for training in the field of fish marketing under Technical

Assistance Programs of FAO, ICA or Colombo Plan.

Australia: There are no rigid professional qualifications which candidates for posts concerned with fish marketing are required to possess, but such qualifications would be of assistance in obtaining the position.

With respect to in-service training, fish marketing personnel are not required to take any training courses but in some, courses in accountancy are encouraged.

Both Commonwealth and State authorities have in the past extended their facilities to FAO and ICA for fellows or trainees wishing to study any aspect of fisheries in Australia. Colombo Plan facilities are also available to persons from those countries in the Colombo Plan.

Hong Kong: A total of some 540 staff are engaged in the Fish Marketing Organization of which nearly 400 are regularly employed on a month to month basis. The remaining staff are temporary workers engaged in accordance with daily and seasonal requirements.

With respect to pre-service qualifications, depending on the grade of post, candidates are required to possess certain scholastic and academic qualifications. Only in special cases are professional qualifications in Fish Marketing or related fields required. However, in certain posts, a knowledge of the trade is important.

As to training facilities, fish marketing personnel are not required to take any training course related to their work, but are encouraged to join evening classes for the study of the English language. Staff joining such classes are subsidized by the Fish Marketing Organization.

Newly appointed Cooperative Officers are, both for the purpose of general cooperative work and for work in connection with marketing, extensively trained during the initial period of employment with the Cooperative Development Department. All Cooperative Officers regularly attend a refresher course conducted by the Department. Other than the courses and lectures mentioned above, no systematic training is given

to the personnel of the Fish Marketing Organization. However, all staff of the Organization are given every opportunity of showing their abilities in a variety of duties and frequent changes are made in order to give the staff the widest possible experience in all aspects of marketing activities.

India :

Bombay

The Department of Fisheries has a Superintendent of Fisheries (Marketing) who is assisted by two assistants.

The minimum qualification for the candidate for posts concerned with fish marketing is a degree in science.

The Inland and Marine Fisheries Training Centres run by the Government of India include "fish marketing" as one of the subjects in their curriculum, although the training imparted is not exhaustive. The entire course extends to a period of 10 months and the trainees get preliminary lessons in economics, food marketing and management of wholesale and retail markets.

Madras

The Department of Fisheries has three Inspectors of Fisheries (Marketing) at Madras city, Mettur Dam and Coimbatore town. They are graduates in science. They are trained in the Fisheries Department for four months in a course which includes training in marketing and cooperation.

Japan: Officers concerned with fish marketing in the Agriculture and Forestry Economics Bureau and the Fisheries Agency are required to possess professional qualifications in fish marketing, economics, food processing or other similar fields. The candidates for those posts are supposed to have received education on some of these subjects in universities (including fishery universities) or colleges.

Fish marketing activities are entirely left to the industry within the general legislative framework established by the Government, and there are no particular training facilities provided by the Government to government personnel.

However, various opportunities provided by international organizations have been utilized by the Government. The Government sent two trainees to the FAO Fish Marketing Training Centre held in Hong Kong and several fellows have been sent abroad for the study of fish marketing.

Federation of Malaya: Only the Distribution and Marketing Officer of the Department of Fisheries is required to possess certain pre-service qualifications.

Officers concerned with fish marketing of both the Department of Fisheries and Cooperative Development are provided opportunities for training as far as possible. The Distribution and Marketing Officer of the Department of Fisheries is an Honours Graduate in Economics. He was awarded an FAO fellowship and completed a year's training course in 1959 in marketing in the United States, Japan, Hong Kong and Thailand.

One of the Fisheries Administrative Officers and two other Fisheries Assistants were awarded Canadian Colombo Plan scholarships and they completed a six months' training course on aspects of fisheries cooperatives and marketing in Canada, Japan and Hong Kong. Three other Fisheries Assistants will be leaving for a similar course this year.

All Fisheries Assistants are also given a period of training, varying from three weeks to one month, on cooperative principles at the Cooperative College in Kuala Lumpur.

The Senior Cooperative Marketing Officer and one of his Cooperative Marketing Officers attended a six weeks' FAO training course on Fishery Cooperatives and Administration in Australia.

Philippines: Opportunities provided by international organizations and conferences have been utilized by the Government for the purpose of training in fish marketing and familiarizing government personnel with fish marketing situations abroad. The Government sent two trainees to the FAO Fish Marketing Training Centre held in Hong Kong in 1954.

Thailand: Four persons, three on a full-time and one on a half-time basis, are engaged in fish marketing work in the Department of Fisheries.

The candidates for these four posts are required to possess professional qualifications in economics, commerce, or law.

The fish marketing personnel are encouraged to take any training course related to their work. The Government sent participants to the FAO Fish Marketing Training Centre in Hong Kong.

U.S.A. (Hawaii): The personnel are all full-time employees, but their duties related to fish marketing or inspection are incidental to the other activities concerned with food and food establishment sanitation.

The minimum requirements are that the candidate must have a college degree and should have majored in hygiene, chemistry, biology, physics, zoology or any one of the physical sciences; however, if a candidate has had enough work experience equivalent to a college requirement, a college degree may be waived.

Sanitarians are required to take training courses related to their work, such as learning laws and regulations, and also training in food technology. New employees are given weekly examinations concerning the rules and regulations and are taken on field trips, inspections and investigations. However, there are no systematic types of training.

IV. PLANS FOR INCREASING OR STRENGTHENING GOVERNMENT FISH MARKETING PERSONNEL

Australia: At present there are positions being created in the Fisheries Division, Department of Primary Industry, for officers trained in economics. These officers will undertake investigations into fish marketing.

Hong Kong: Since the establishment of the Fish Marketing Organization, the tendency has been (and continues to be) to demand higher qualifications in new recruits to the Organization. Relatively higher qualifications are now

required for the filling of vacant post as compared with requirements immediately after the end of the Pacific War. There are, however, no plans for the increase in the establishment of personnel and no particular stress will be given in the training of Fish Marketing staff other than as already mentioned.

India :

Bombay

For the moment no substantial addition to the existing staff is contemplated.

Necessity of introducing the subject on fish marketing in the curriculum of established schools is not felt. It is felt, however, that, in order to strengthen fish marketing personnel, in-service training courses at regular intervals would be useful. In this connection, the Department feels that the Government of India may consider the question of starting such courses, for the benefit of the Fisheries Departments of various States. It would be uneconomical and impracticable for State Governments to start any such activities individually.

In the absence of institutions imparting training in fish marketing, the Department considers that training facilities provided by international organizations such as training centres, conferences and fellowships should be taken advantage of whenever opportunities are presented.

It is proposed to strengthen the fish marketing unit under the Third Five Year Plan period for carrying out more comprehensive marketing surveys and to promote fish trade.

Japan: The Government now puts on increased emphasis on marketing. The Ministry of Agriculture and Forestry has set up a committee to investigate problems concerning marketing of fruits, vegetables and fish. The strengthening of government services in fish marketing might be considered as a result of this investigation.

Federation of Malaya: It is reported that the problem of strengthening government ser-

vices in fish marketing is currently under review by the Ministry of Agriculture and Cooperatives.

Thailand: The Government currently contemplates increases in services for fish marketing, i.e. setting up a new fish market in the southern part of Thailand, constructing new fishing piers in provinces, provision of transport facilities, and training of fishermen in navigation and engine operation. Therefore, the strengthening of qualified staff through recruitment of university graduates or equivalent in the field of economics and commerce or through occasional transfer of personnel from other Departments is considered.

Arrangements with educational institutions for the organization of correspondence courses or other after-working-hours study are also considered useful.

V. TRAINING OF PERSONNEL ENGAGED COMMERCIALY IN FISH MARKETING

Hong Kong: Fish wholesale business is conducted by the Fish Marketing Organization and the Government does not sponsor the training of personnel engaged commercially in fish marketing.

India: The Department has no objection to sponsor the training of personnel from non-governmental agencies. A Managing Director of a Cooperatives Association was awarded a fellowship by FAO to study abroad.

Japan: Fish marketing business is entirely left to commercial enterprises and generally speaking it is not considered necessary for the Government to sponsor any training facilities for the commercial fish marketing personnel. Most of the personnel employed by fish marketing enterprises are graduates of commercial or fisheries high schools and they undergo some sort of practical training in techniques of fish marketing through daily work.

Thailand: The Government assists training abroad for personnel engaged commercially in fish marketing by financing the expenses of air transportation and subsistence.

VI. TRAINING FACILITIES PROVIDED BY INTERNATIONAL ORGANIZATIONS

It has already been mentioned that most countries have taken advantage of the FAO Fish Marketing Training Centre. Fellowships for the study of fish marketing abroad have also been an important means of training fish marketing personnel.

Some comments have been made on training facilities provided by international organizations, as follows:

Australia: Australia has not participated in training centres concerned with the training of officers in fish marketing. It is thought that training by FAO and similar agencies would be more effective if it were carried out on a limited regional basis or, in some cases, on a national basis. This method would enable a greater number of participants from the country or countries concerned, the majority of which have similar problems and produce the same species of fish, to receive more effective training. Thus all participants would be at about the same level and there would be very little or no language difficulty.

Hong Kong: Every advantage is taken of FAO meetings and training centres where such meetings and training centres are consistent with the work and requirements of the Cooperative Development Department. Meetings and training centres (apart from the Fish Marketing Center in Hong Kong in 1954) are attended by

government servants of the Cooperative Development Department, and not by staff of the Fish Marketing Organization (which employs the largest number of wholesale fish marketing personnel). It is not likely that staff employed by the Fish Marketing Organization would be sent to FAO-provided training centres operated in other countries unless the centre concerned a specific problem of particular importance to the Organization.

India:

Bombay

The Department of Fisheries has taken advantage of facilities afforded by FAO wherever possible. Two officers were trained at the Hong Kong training course.

Adequate funds were available to finance government participation in the programs. Considering the duration of the course conducted by FAO, the extent and quality of training were adequate.

The form and extent of the training should be such as would equip the candidate with a knowledge of the marketing systems followed in advanced countries and enable him to draw up practical fish marketing schemes, which could be suitable to the conditions obtained in the locality where the scheme would be implemented.

Sufficient emphasis may also be given to practical study, seminars and discussions with experts taking into consideration the marketing practices in the respective countries.

Part B

Council's Review of the Report and Recommendations arising therefrom

- I. FISHERIES DEVELOPMENT AND ADMINISTRATION
- II. FISHERIES CREDIT
- III. SUBSIDIES AND INCOME TAX EXEMPTION
- IV. FISHERIES CO-OPERATIVES
- V. FISH MARKETING
- VI. FISHERIES STATISTICS

PLANNING FOR FISHERIES DEVELOPMENT AND FISHERIES ADMINISTRATION

The Council heard with great interest a report made by the delegate from the Federation of Malaya, regarding the conduct of a national seminar on fisheries development planning, organized in November 1960 in compliance with recommendations of the Fourth FAO Regional Conference, 1958, and of the 8th Session of the IPFC. Officers from the Fisheries Department and from other government agencies concerned, i.e. the Treasury Department, the Rural and Industrial Development Authorities, the Department for Cooperative Development, the Ministry of Commerce and Industry, etc., attended the seminar, together with officers from FAO. These latter government agencies, which were in some way concerned with the formulation of programs for development of fisheries, had so far had little chance to acquaint themselves with fisheries problems. The seminar was successful in familiarizing these people with problems and difficulties encountered by the fishing industry and it was expected that better coordinated development programs would be formulated. The Council noting that fisheries administration in many of the member countries is insufficiently staffed and often overlooked in overall development planning, recommended that Member Governments should consider the possibility of organizing such seminars in their countries. The Council also requested the Government of the Federation of Malaya to make available to Member Governments copies of the report of the seminar, when it is published.

Emphasizing the importance of the role of the government fisheries administration in effective planning for and successful execution of development programs, the Council noted that FAO was actively assisting Member Governments to organize or improve their fisheries services and was making studies on fisheries administration with an intention to organize eventually an international meeting on this subject.

Arising from the discussions on formulation of a coordinated fisheries development program, the Council felt that much more attention should be paid by Member Governments to fishermen's communities which need great improvement in living conditions. It was stressed that funds were required not only for production but also for the promotion of fishermen's welfare. Some delegates reported that housing schemes for fishermen were being carried out in their country.

The Council recognized that, as fisheries developed in the Indo-Pacific Region, the economic aspects of fisheries production, processing and marketing, were becoming more and more important. The Council, therefore, was of the view that Member Governments, in their fisheries services, should place emphasis on these aspects as well as on technological improvement. The Council recommended that during the inter-sessional period Member Governments should report to FAO on economic problems impeding fisheries development in their countries. The Council requested FAO to assist in collecting such information and to present it to the 10th Session of the IPFC.

FISHERIES CREDIT

The Council reviewed the report, "Government Credit Schemes, for Fishery Industries in the Indo-Pacific Region". It was noted that the report was comprehensive, covered most of the governmental credit schemes currently carried out in the member countries, and as foreseen at the 8th Session, it constituted a useful contribu-

tion to the Technical Meeting on Credit for Fisheries Industries held in Paris, October, 1960. The report reveals details of arrangements with respect to the purposes, sources of funds and operations of credit schemes which vary widely from country to country, and that Member Governments generally consider fishery credit as a most effective means for the development of their fishing industries.

The Council stressed that governmental loans should particularly be extended to small scale fishermen who have a great need for funds but who are unable to provide tangible securities. It was noted, therefore, that the problem of security should be carefully studied with a view to facilitating such loans.

Many instances were reported where fishermen's cooperatives were used as a channel for governmental loans and where the cooperatives assumed collectively the responsibility for the repayment. This arrangement should, wherever possible, be associated with cooperative marketing operations so that the cooperatives could secure repayments from the proceeds of sales of the catch. It was also reported that in Ceylon and Malaya loans are being extended on a hire-purchase basis and that this arrangement has greatly decreased the difficulty caused by lack of security. The need for promoting savings and deposits by members with their cooperatives to provide adequate security for the loans was also stressed.

Arising from the discussions on security, it was reported by the delegates from several member countries that suitable arrangements for insurance for fishing boats and gear were lacking, and that when insurance services of commercial companies were available, the premium tended to be too high for the fishermen to meet. Some Governments were considering setting up funds for insurance schemes and the Council considered that such schemes were indispensable to protect fishermen and to promote the flow of funds into this sector. The Council therefore, recommended that Member Governments should, where appropriate, make suitable financial arrangements for insurance.

The Council noted that a major problem encountered in many countries in the administration of credit schemes was the difficulty in collecting the repayments. In many cases, fishermen lack the feeling of responsibility for repayment and this, coupled with the lack of suitable machinery for collection, has caused great difficulty in the operation of credit schemes. The importance of evaluating the progress of credit schemes was also emphasized. The Council recommended that a study should be made of the organization and administration of credit schemes including effective systems to secure collection of the repayment. The Council requested FAO to assist by preparing a suitable questionnaire. The Council further noted the outcome of the discussions at the recent Technical Meeting on Credit for Fishery Industries, and endorsed the recommendation made at that Meeting that FAO, under the Expanded Technical Assistance Program, should help its member countries to organize effective credit services; and should examine the possibility of arranging regional training centres for personnel engaged in credit institutions.

It was pointed out that, in many cases, fishermen are illiterate and heavily indebted to middlemen. Public loans would easily be wasted if lending agencies lacked a proper understanding of the social and economic structure of the fishermen's community. Public credit institutions should give special attention to the effective use of credit as a mean of reducing fishermen's indebtedness. The Council, therefore, urged the Member Governments to assess various needs for financial assistance of fishermen and to set up credit and loan schemes which would be most suitable under the prevailing social and economic conditions.

The Council examined the report "Investigation and Assessment of the Financial Situation of Fishermen" which had been prepared by the FAO Technical Secretary on the basis of replies to a questionnaire circulated during the inter-sessional period. The Council noted that the report constituted a useful basis for further study on the subject which would help Governments in formulating fishery programs and parti-

cularly in planning financial aid schemes to improve the welfare and financial conditions of fishermen.

SUBSIDIES AND INCOME TAX EXEMPTION

Arising from the discussions on governmental financial aid to fisheries, the delegate from Pakistan pointed out that, in some countries, agricultural produce is exempted from income tax. The Council, recognizing that fishing is also a primary industry which has an economic structure similar to agriculture, recommended that Member Governments should consider the application of the same fiscal measure to fish catches. The Council further noted that, in many countries, purchase of fishing implements is subsidized and that such a fiscal aid was effective in facilitating fisheries development, particularly at its initial stage. The Council, therefore, recommended that Member Governments should consider granting such subsidies and exemptions wherever desirable.

FISHERIES COOPERATIVES

There was considerable discussion as to the extent to which governments should intervene in the promotion of fishermen's cooperatives. Although spontaneity on the part of the fishermen was most important, such spontaneity was lacking in many of the member countries, and in many instances, governments had had to come forward to organize cooperative societies and to help in their management. In some cases, however, extensive governmental assistance was taken for granted by fishermen and tended to hamper the growth of a sense of responsibility. Some "cooperatives" had been formed merely as a machinery to meet a particular need, e.g. receiving governmental financial aid, and had little interest in other activities which should be undertaken by proper cooperatives. As a result these groups dissolved when a governmental aid was discontinued. The Council urged that as long as governmental assistance was needed, governments should invoke all possible means such as extension work and educational activities to inspire fishermen's interest in cooperative activities.

The Council considered that the extent of governmental intervention should depend largely on the stage of fisheries development and the social and educational conditions in fishermen's communities in the respective countries and that while governments should extend proper assistance to cooperatives the fishermen's own interest is the fundamental element which would make the cooperatives ultimately successful.

The Council felt that in order to establish detailed government programs with respect to fishermen's cooperatives, more comprehensive information was required concerning the organization and activities of the fishermen's cooperatives in the Region, and noted the recommendations made at the Technical Meeting on Fishery Cooperatives, Naples, May 1959, and at the subsequent meeting of the FAO/ILO ad hoc Working Group on Fishery Cooperatives held in Geneva, October 1960. The Geneva Working Group made suggestions regarding future activities in this field which might be undertaken on a country or an international basis, suggested that, among other things, international organizations concerned should request member countries to supply relevant information on fishery cooperatives, including annual reports of cooperative organizations, legislation, statistics, periodicals and other literature, and that, in seeking such information, they should consider the possibility of obtaining assistance from the regional fishery councils serviced by FAO. The Council was of the view that such assembly and subsequent dissemination of this information would be most useful to member countries in the Region. The Council, therefore, endorsed these suggestions and requested FAO to make the necessary arrangements.

Although over four thousand fishermen's cooperatives had been organized in Japan, many of them were small scale societies on a village level and their funds and the scope of their activities were limited. As a result, many such fishermen's cooperatives have found themselves in a difficult financial position. In view of this, the Japanese government has been helping these cooperatives by means of subsidies and loans to expand their economic scale of operations either by adequate

amalgamations or by formation of a federation of fishermen's cooperatives. In West Pakistan also the organization of a federation of fishermen's cooperatives was in the initial stages of discussion. The Council was of the view that Member Governments should encourage the organization of fishermen's cooperatives on as large a scale as possible. Organization of co-operatives in too small a scale had been one of the major reasons for failure.

FISH MARKETING

The Council examined the report "Review of Government Fish-Marketing Activities in the Indo-Pacific Region (Revised)" which had been prepared during the inter-sessional period on the basis of the replies received to the questionnaire circulated by the Technical Secretary. It was noted that the report was comprehensive and covered almost all member countries in the Region with respect to the wide range of fish marketing activities carried out by Member Governments.

Within the Region, governments are deeply concerned with the improvement of fish marketing conditions and this is reflected in the varied types of governmental intervention and assistance, i.e., public or semi-public ownership of marketing facilities and direct participation in marketing activities by government authorities, fiscal and financial measures, training of marketing personnel, extension and promotional services, supervision and regulation of marketing operations, technological and economic research, and marketing intelligence. It was noted that information contained in the report would be useful for countries which were endeavouring to improve their fish marketing situation.

The Council noted that the Karachi Wholesale Fish Market is run by the Karachi Fishermen's Cooperative Society under the supervision and direction of the Fisheries Department, and that auctions are carried out by the licensed wholesale dealers who formerly operated at the old Karachi Market. These arrangements are tentative and the situation will be reviewed after a period of time, to determine the most suitable type of organization and practice. So

far, however, the fish marketing conditions in the Karachi area have been much improved since the opening of the new Wholesale Fish Market. It was noted that when setting up the Karachi Wholesale Fish Market the organization and practices of the Fish Marketing Organization in Hong Kong were studied as a possible model but that considerable alterations were made in order to meet the different local conditions. The Council also took note of the recent FAO publication, "The Economic Role of Middlemen and Cooperatives in Indo-Pacific Fisheries" which contains useful information and an analysis of the respective roles played by the government, fishermen's cooperatives and middlemen in Hong Kong and the Thana District in Bombay.

It was reported that in certain countries private merchants built wholesale markets, and sales were conducted by the method of bargaining and often using whispering bidding. The question was raised whether wholesale fish markets should be operated by public bodies, namely national, local or municipal governments, or by private firms. The Council was of the opinion that, in view of the public nature of the wholesale activities it would be preferable for governments or local public bodies to assume the responsibility of the construction and administration of such markets, and that, when appropriate, fishery cooperative organizations should be allowed to operate them under Government supervision.

The Council discussed the report "Fish Transport Organization and Facilities in the Selected Fishing Centres in the Indo-Pacific Region". It was pointed out that under the tropical conditions in the Region transport of fish is a most critical problem and that governments should pay much more attention to the improvement of transport facilities. It was stressed that apart from necessary hygienic restrictions, governments should encourage the industry to use the most efficient means of transportation economically available.

It was noted that certain countries were planning to build a limited number of well-equipped landing centres with necessary unload-

ing and transport facilities. It was, however, pointed out that the selection of sites for such landing centres should be made carefully to avoid inconvenience to the fishing industry and being uneconomical for small operators.

The Council noted that the Fisheries Division of FAO was preparing a manual on fish markets and terminals which would include descriptions of typical wholesale fish markets in various countries. The Council was of the view that such a manual when published, would be very helpful to governments in the Region in their planning and improvement of wholesale fish markets in main landing centres, and that due consideration should be given to the problem of fish transport to consumption centres.

The Council felt that it was difficult to appraise the fish transport situation without reference to other aspects of fish production and marketing, particularly cold storage, ice-making and processing facilities. It therefore recommended that a review should be made of the present situation and prospects for development of cold storage, ice-making and processing facilities in the Region with due regard to their economic aspects, and requested FAO to prepare a suitable questionnaire and circulate it to member countries to facilitate collection of the pertinent information.

The Council studied a report on "Government Departments concerned with Fish Marketing, their personnel and training facilities in the Indo-Pacific Region". It was noted that the present report dealt largely with duties of various governmental departments and with qualifications for personnel but that little had been done to examine the need for trained personnel in terms of number and qualifications in relation to the present fish marketing programs. The Council therefore felt it desirable for Member Governments to give further consideration to this matter with a view to clarifying the specific types of training required, and that such an examination would be of help when future training centres or seminars in fish marketing are organized for the Region. The Council therefore recommended that the present review of government departments concerned with fish marketing

and their personnel and training facilities continue, and requested FAO's continued assistance.

In the discussions on required qualifications, the importance of technological, social and economic knowledge, adequate field experience, and a knowledge of accounting was stressed. The Council emphasized that such training should cover these aspects and that lecturers should be recruited from the Region or should possess an adequate knowledge of the fish marketing conditions of the Region.

It was also pointed out that while some countries in the Region had considerable educational and training facilities, many trainees and graduates were unwilling to seek employment in fisheries work or were unable to find appropriate jobs. The Council felt that in such circumstances adjustment would be necessary in the light of the requirements of personnel both in the government fisheries administration and in the industry, with due consideration to fishery development programs, and that governments might take measures to improve conditions of employment in order to make the work in the field of fisheries more attractive.

The Council noted that in view of the recent rapid increase in fish production as a result of the increasing mechanization of fishing vessels and the adoption of synthetic fibre nets and other modern technological devices, it was becoming more and more important to reorganize or improve marketing systems and practices. It was stressed that a lack of adequate and efficient organization of marketing would discourage fishermen's interest in increased production, thus hampering fishery development. The Council further noted the importance of the analysis of fish marketing costs and recommended that such a study should be undertaken in the Region with FAO assistance.

FISHERIES STATISTICS

The Council stressed the importance of statistics as a sound basis for the formulation of fisheries programs, and made a careful review of activities being carried out in member countries concerning collection of various fishery statistics.

The Council noted that in most of the member countries, the number of personnel employed for collection and processing these statistics was inadequate and therefore urged Member Governments to consider strengthening the staff and other facilities. The Council recalled that implementation of a minimum program for the collection and compilation of fishery statistics had been recommended repeatedly in previous sessions to Member Governments, and emphasized the need for adequate measures to strengthen existing facilities.

The Council also emphasized the importance of clearly defining the purposes for which the statistics were to be collected. Fishery statistics may be collected for biological or economic analyses as well as for assessing technological development and the types of statistics to be collected should be decided accordingly. Where the staff available is limited such considerations would save a great deal of time and effort.

The Council noted that an FAO Training Centre in fishery statistics was held in Bombay in 1959, and expressed the view that, wherever appropriate, sampling systems should be applied to the collection of statistics, but that other methods should also be used wherever appropriate. Where fish markets or marketing co-operatives are well organized, these can facilitate the collection of statistics of catch and distribution, e.g. the new Karachi Wholesale Fish Market had greatly facilitated the collection of the statistics in the Karachi area.

The Council recommended that FAO should prepare a manual of fishery statistics for the use of the statistics workers in the member countries. Such a manual would be of value for the

purpose of improving practices in collection and processing statistics and also would be instrumental in the standardization of items, methods and practices.

The Council noted the importance of efficient collection and prompt processing of statistics, and that in some member countries, card systems and IBM machines had been used quite successfully. However, IBM Systems are expensive and the Council recommended that FAO should make a study with a view to devising more economical methods.

Many Member Governments reported that difficulty had arisen in the collection of catch statistics where such collection was associated with income tax collection, or where internal revenue officers had access to the catch figures of individual fishermen. In such cases fishermen often became suspicious and were reluctant to give the data to statistical officers. The Council, therefore, stressed that these statistics should be strictly confidential, and recommended that Member Governments should separate the activities of fishery statistics collection from their internal revenue operations.

While a certain amount of information on personnel and other facilities presently available to Member Governments for collection of fishery statistics is contained in the Report of Training Centre on Fishery Statistics, Bombay, the Council considered that fuller information on these facilities would form a basis for further action by the Council. It was recommended that Member Governments should make available to the Council the information regarding present arrangements and facilities for the collection of fishery statistics.

CHAPTER VI

RECOMMENDATIONS

INTRODUCTION

A. TO MEMBER GOVERNMENTS	244
B. TO F.A.O.	246
C. TO EXECUTIVE COMMITTEE	248
D. TO TECHNICAL COMMITTEES . . .	248
E. TECHNICAL ASSISTANCE	250

INTRODUCTION

The Council's recommendations, arising from its review of procedure and the inter-session and session activities of its various Committees, Panels and Sub-Committees are given in full in the preceding chapters.

The following is a brief review of these recommendations, stripped of unessential phrasing and with cross reference to the full recommendations as approved by the Council.

A. TO MEMBER GOVERNMENTS

Recommendations relating to subjects within the terms of reference of Technical Committee I, and requiring the attention of Member Governments are:

(a) *Information*

Governments to request appropriate institutions to forward publications on fisheries biological subjects to IPFC Secretariat, which will circulate lists of such publications. (Ch. II, p. 96)

Governments to request appropriate institutions to forward lists of fisheries workers to F.A.O. (Ch. II, p. 96)

(b) *Tuna*

Governments to furnish reports on current and planned research on tuna biology. (Ch. II, p. 96)

(c) *Mackerels*

Governments concerned to continue or to initiate population studies on Rastrelliger and to forward records of length sampling operations to

the Chairman, Rastrelliger Sub-Committee. (Ch. II, p. 96)

(d) *Chanos*

Governments to intensify investigations and to report to 10th Session concerning propagation in confined waters. (Ch. II, p. 97)

(e) *Hilsa*

Governments concerned to afford greater facilities for research and cooperation of workers in this field. (Ch. II, p. 97)

(f) *Mugil*

Governments to contribute data on *M. cephalus* for the preparation of a "Biological Synopsis" through the courtesy of CSIRO, Australia. (Ch. II, p. 97)

Governments to undertake studies in breeding of *Mugil*.

(g) *Prawns and Shrimps*

Governments to nominate Members of a Special Sub-Committee. (Ch. II, p. 97)

(h) *Molluscs*

Governments to report on studies of pearl oyster fisheries and to forward publication or lists of publications on this subject to IPFC Secretariat for distribution. (Ch. II, p. 98)

(i) *Plankton*

Governments to inform IPFC Secretariat of the general kinds of organisms of interest and the nets employed in sampling them. (Ch. II, p. 98)

(j) *Identification of Aquatic Organisms*

Governments to supply FAO Fisheries Division with new and revised check-lists of aquatic organisms, taxonomic publications and bibliographies. (Ch. II, p. 98)

(k) *Oceanography*

Attention of Governments drawn to the work of the International Indian Ocean Expedition. (Ch. II, p. 99)

(1) *Basic Productivity*

Attention of Governments drawn to the Symposium on this subject at 10th Pacific Science Congress. (Ch. II, p. 99)

(m) *Water Pollution*

Attention of Governments drawn to the Conference on Water Pollution Problems, Geneva, 1961. (Ch. II, p. 99)

(n) *Aquatic Weed Control*

Governments to submit all available information on the use of fish to control aquatic weeds to FAO Fisheries Division. (Ch. II, p. 99)

(o) *Stocking*

Governments to evaluate the consequences of the introduction of exotic fish species and report to 10th Session. (Ch. II, p. 99)

(p) *Fish Culture and Disease Control*

Governments to initiate and develop studies on pond fish nutrition and transmit relevant information to IPFC. (Ch. II, p. 99)

Governments to report on use of anaesthetics and tranquilizers in handling and transport of fish. (Ch. II, p. 99)

Governments to provide all available information on spread of disease and parasites to FAO Fisheries Division for compilation and presentation at 10th Session. (Ch. II, p. 100)

(q) *Fish Culture in Rice Fields*

Governments to seek close cooperation between relevant agencies concerned with rice production and fish propagation and culture. (Ch. II, p. 100)

II. Recommendations relating to Craft and Gear and requiring the attention to Member Governments are:

(a) *Research*

Governments to promote and develop research in fishing craft and gear. (Ch. III, p. 135)

(b) *Duties and Taxes*

Governments to consider exemption from duties and taxes.

(i) on fuel and oil for the fishing industry (Ch. III, p. 135)

(ii) on synthetic fishing gear materials (Ch. III, p. 137)

(iii) on tin plate for fish canning (Ch. IV, p. 175)

(iv) in connection with income tax (Ch. V, p. 240)

(c) *Mechanization*

Governmental development schemes to be based on a quantitative evaluation of the effects of mechanization of craft. (Ch. III, p. 135)

Governments to encourage mechanized handling of gear. (Ch. III, p. 135)

Governments to assist FAO to compile a comprehensive review of the effects of mechanization. (Ch. III, p. 135)

(d) *Engine Procurement*

Governments to give high priority to financial aid to fishermen for the purchase of engines. (Ch. III, p. 136)

(e) *Ports*

Governments to give high priority to the provision of fish harbour and landing facilities. (Ch. III, p. 137)

(f) *Safety Regulations*

Governments should avoid impractically high standards for fishing craft. (Ch. III, p. 137)

(g) *Weather Forecasting*

Governments should provide adequate services. (Ch. III, p. 137)

(h) *Synthetic Fishing Gear Materials*

Governments to study the feasibility of local production. (Ch. III, p. 137)

(i) *Fish Detection*

Governments to give high priority to testing use of echo-sounding and echo-ranging equipment. (Ch. III, p. 138)

(j) *Training*

Governments to consider further the possibilities of establishing national training centers for boat building and fishermen's training. (Ch. III, p. 138)

III. Recommendations relating to Food Technology and requiring the attention of Member Governments are :

(a) *Icing of Fish*

Governments urged to provide facilities for the supply of ice to fishermen at reasonable prices, possibly by establishing small flake-ice plants in fishing villages. (Ch. IV, p. 172)

(b) *Transport*

Governments to study feasibility of air transport of fresh and frozen fish, possibly at reduced freight rates. (Ch. IV, p. 172)

Governments to aid FAO in collecting information on fish transport containers. (Ch. IV, p. 173)

Governments urged to provide increased facilities for transport and distribution. (Ch. IV, p. 173)

(c) *Fish Curing and Drying*

Governments to ensure supply of good quality salt to fish-curers. (Ch. IV, p. 173)

Governments to advise fish dryers to improve drying condition by using racks. (Ch. IV, p. 173)

(d) *Fermented Fish Products*

Governments' attention drawn to spray-drying of fermented fish sauces. (Ch. IV, p. 174)

(e) *Plankton as Food*

Governments' attention drawn to this subject. (Ch. IV, p. 174)

(f) *Canned Fish*

Governments to explore possibilities of canning certain tropical fish species. (Ch. IV, p. 175)

(g) *Research*

Governments to encourage research in fish processing technology. (Ch. IV, p. 175)

(h) *Exhibition*

Governments to supply samples of fisheries products for exhibition at IPFC 10th Session. (Ch. IV, p. 175)

IV. Recommendations relating to Socio-economics and Statistics and requiring the attention of Member Governments are :

(a) *Fisheries Development Planning*

Governments to consider organizing national seminars on this subject. (Ch. V, p. 238)

Governments to prepare reports on factors impeding fisheries development. (Ch. V, p. 238)

(b) *Fisheries Credit*

Governments to give consideration to studying developing credit schemes, particularly with reference.

(i) to small-scale fisheries

(ii) to developing insurance facilities

(iii) to collection of repayments. (Ch. V, p. 239)

(c) *Cooperatives*

Governments to encourage development of large cooperative organizations through extension and education. (Ch. V, p. 241)

(d) *Fish Marketing*

Governments to assume responsibility for construction and operation of wholesale fish markets and when appropriate, fishery corporations to operate them under Government supervision. (Ch. V, p. 241)

(e) *Statistics*

Governments to consider strengthening statistical services and implement a minimum programme for the collection of statistics. (Ch. V, p. 243)

Governments to separate fisheries statistics for internal revenue operations. (Ch. V, p. 243)

Governments to prepare reviews of present arrangements and facilities for the collection of statistics. (Ch. V, p. 243)

B. TO F.A.O.

I. The Council considered that the budgetary provision for its operation was inadequate and requested F.A.O. to provide at least the amount indicated in the Estimates of Expenditure for 1961 and for the Biennium 1962-63. (Ch. I, p. 23)

II. The Council requested F.A.O. to do its utmost to ensure the adequate provision of French-English interpretation services at future sessions of the Council. (Ch. I, p. 29)

III. The Council requested FAO to strengthen its Regional Office at Bangkok with the addition of a Craft and Gear Technician and a Fisheries Economist-cum-Marketing Officer, to give the highest priority to these posts and appoint these officers during 1961. (Ch. I, p. 22)

IV. Recommendations relating to the subjects within the terms of reference of Technical Committee I and requiring the attention of FAO are:

(a) *Information*

FAO to urge institutions and journals to standardize the form of published papers on fisheries to include institutional and current addresses of authors. (Ch. II, p. 96)

FAO to furnish on request check-lists of workers on specialized subjects. (Ch. II, p. 96)

(b) *Reference Books*

FAO to give priority to Manual on Sampling Methods. (Ch. II, p. 96)

(c) *Molluscs*

FAO to furnish list of workers interested in pearl oyster, trochus and other nacreous molluscs of commercial interest. (Ch. II, p. 98)

(d) *Identification of Aquatic Organisms*

FAO to compile comprehensive lists of scientific and common names. (Ch. II, p. 98)

(e) *Aquatic Weed Control*

FAO to compile all available information on the use of fish for aquatic weed control. (Ch. II, p. 99)

(f) *Fish Culture and Disease Control*

FAO to compile information on the use of anaesthetics and tranquilizers for handling and transport of fish. (Ch. II, p. 99)

FAO to compile information on special and control of diseases and parasites. (Ch. II, p. 100)

V. Recommendations relating to Craft and Gear and requiring the attention of F.A.O. are:

(a) *Mechanization*

FAO to keep Member Governments informed of the developments of technical characteristics, availability and prices of diesel outboard engines. (Ch. III, p. 135)

FAO to prepare a comprehensive review of the effects of mechanization of craft and gear in the Indo-Pacific Region. (Ch. III, p. 135)

(b) *Surf Landing Craft*

FAO to seek information regarding the interest of Member Governments in this subject. (Ch. III, p. 136)

(c) *Fiber glass-Plastic Boats*

FAO to investigate the possibilities of providing one such boat in the Region for testing. (Ch. III, p. 136)

(d) *Modern Trawl Nets*

FAO to distribute GFCM Studies and Reviews No. 13 to all Member Governments. (Ch. III, p. 137)

VI. Recommendations relating to Food Technology and requiring the attention of F.A.O. are:

(a) *Icing of Fish*

FAO to obtain data on the smallest "economic unit" iceplant suitable to meet fishing village requirements. (Ch. IV, p. 172)

(b) *Freezing of Fish*

FAO to prepare a report on freezing and cold storage, (Ch. IV, p. 172) and processing and marketing costs (Ch. V, p. 242)

(c) *Transport*

FAO to seek governments cooperation in compiling information on fish transport containers. (Ch. IV, p. 173)

(d) *Fish Drying*

FAO to study and report on different drying processes. (Ch. IV, p. 174)

(e) Publications

FAO to publish Sections I and VII of the Fisheries Products Manual as separate reprints. (Ch. IV, p. 175)

FAO to publish Fisheries Products Manual in full as soon as possible. (Ch. IV, p. 175)

VII. Recommendations relating to Socio-economics and Statistics and requiring the attention of FAO are:

(a) Fishery Development

FAO to compile information from Member Governments on factors impeding fisheries development. (Ch. V, p. 238)

(b) Fishery Credit

FAO to prepare questionnaire on organization and administration of credit schemes, with particular reference to methods of repayment. (Ch. V, p. 239)

(c) Cooperatives

FAO to arrange assembly and dissemination of information based on recommendations of Geneva Working Group. Ch. V, p. 240)

(d) Fish Marketing Personnel

FAO to continue assistance in reviewing this subject. (Ch. V, p. 242)

(e) Fisheries Statistics

FAO to prepare and publish a Manual on Fishery Statistics. (Ch. V, p. 243)

FAO to study current methods of processing statistics in order to devise more economical methods. (Ch. V, p. 243)

C. TO EXECUTIVE COMMITTEE

I. The Secretary was instructed to refer additional proposals for the Amendment of the Agreement not included in the revised Agreement as adopted during the Session, to Member Governments for consideration and reference to the 10th Session of the Council. (Ch. I, p. 29)

II. The Council instructed the Secretary to ensure the printing and distribution of the Proceedings of the Ninth Session as soon as possible. (Ch. I, p. 30)

III. Recommendations relating to subjects within the terms of reference of Technical Committee I and requiring the attention of the Executive Committee are:

(a) Mackerels

Secretariat to prepare for publication as an Occasional Paper records of length sampling operations on *Rastrelliger* as received from Member Governments. (Ch. II, p. 96)

(b) Prawns and Shrimps

Secretariat to circularize Member Governments to obtain nomination for a Special Subcommittee. (Ch. II, p. 97)

(c) Molluscs

Secretariat to compile and distribute lists of publications on nacreous molluscs of commercial importance. (Ch. II, p. 98)

(d) Fish Culture

Secretariat to compile and distribute reprints on pond fish nutrition. (Ch. II, p. 99.)

D. TO TECHNICAL COMMITTEES

I. General

(a) The consensus of opinion of Member Governments was in favour of inter-session Technical Committee meetings provided the agenda was restricted to one subject.

The Technical Committees were instructed to keep this matter in view when preparing recommendations for the Council's programme for the ensuring inter-session period. (Ch. I, p. 30)

(b) The Council recommended that Panel A, Inland Fisheries; Panel B, Sea Fisheries, and

the Sub-Committees on Rastrelliger, Chanos, Hilsa and Fish Culture in Rice Fields of Technical Committee I, and Panel A, Craft and Gear; Panel B, Food Technology; Panel C, Socio-Economics and Statistics and the Sub-Committee on Fish Marketing of Technical Committee II should continue to function. (Ch. I, p. 30)

(c) The Council recommended that at the 10th Session the work of Panels and Sub-Committees be appraised in the light of programs achieved in the inter-session period and that as necessary they be re-constituted or discontinued. (Ch. I, p. 30)

II. Technical Committee I

(a) Concerning the *modus operandi* of Technical Committee I, the Council recommended the following procedure:

1. A new work program should be adopted, which while retaining all the good features of the former ones—would group the various subjects and problems according to only five or six major fields of activity.

A careful choice of these major fields and their continued use as the framework for both work and reporting would ensure a stability of the work program, promote a better grouping of allied subjects, and enable the addition of new subsidiary topics or the deletion of old ones without disturbance to the major framework. Furthermore it would make reporting far simpler.

The new work program is outlined below and has been used as the framework for reporting upon the Technical aspects of Technical Committee I's work at the 9th Session.

2. The work of the two Panels (A & B) as well as the work of the Sub-Committees closely associated with Technical Committee I, should not be reported separately in the Inter-session Report but should be listed under the general field of activity with which they are clearly associated.

Thus, for example all work on mackerels, clearly the work of Panel B and the Rastrelliger Sub-Committee, would be listed under the heading "Mackerels".

3. To eliminate repetition in reporting and to lessen the number of separate reports which must be examined (by the Chairman of Technical Committee I and the Technical Secretary), and to clarify the method of reporting, the Council recommended the following procedure.

It should be the function of the Chairman of Technical Committee I, working in close connection with the Technical Secretary to request each member of Technical Committee I, well in advance of each forthcoming session of the Council, to submit one single report on the inter-session activities of each respective country. This will include the report of both Panel A and B members and also the Sub-Committee members, that is, each country representative on Technical Committee I will solicit and receive from his fellow country representatives on Panels A and B and the Sub-Committee, their individual reports. He will combine these into one single report arranged according to the outline of the Program of Work and submit it to the Chairman of the Technical Committee I.

4. Upon receipt of all these inter-session reports, i.e. those from the country representatives, the Chairman together with the Technical Secretary will study them, and prepare from them again following the outline of the Program of Work—a summary report of the activities of the Committee, its Panels and Sub-Committees. The Chairman will send any material relevant to the work of each Sub-Committee directly to the Chairman of the Sub-Committee concerned.

The final report will not confine itself to recom compilations of the work performed by individual countries, but will in fact go beyond this point in attempting a general stock-taking of individual or collective endeavour, on analysis of

trends and, where warranted, some suggestions for future work. (The latter may then be considered at the forthcoming Session of the Council).

The individual country reports as well as the reports from the Sub-Committee Chairmen will remain unchanged by the Chairman and Secretariat, except perhaps for minor editing, and shall appear as appendices to the Inter-Sessional Report by the Chairman.

5. This report including its appendices (which will not exceed the total number of member countries and the several Sub-Committees) should be completed well in advance of each forthcoming session, issued as a Working Paper, and examined, if possible, by the Council members prior to the Session. A minimum amount of the time of the Committee should be devoted to its revision at the Session itself, and this time should be confined to the revision of the Report itself and not of the appendices.

The Council further recommended for consideration at the 10th Session that the Chairmen of Panels A and B and the Rapporteur be elected for the Session only.

(Ch. II, pp. 93-94)

(b) Part B of Chapter II, pp. 92-100.

III. *Technical Committee II*

Part B of Chapter III, pp. 135-138

Part B of Chapter IV, pp. 172-175

Part B of Chapter V, pp. 238-243

E. TECHNICAL ASSISTANCE

I. The Council recommended that FAO Fisheries Division be requested to explore the possibilities for establishing a Rastrelliger Workshop and a Training Centre for Fishery Officers in Fishing Craft and Gear. (Ch. I, p. 31)

II. The possibility of establishing one or all of the following centres should be examined, in the light of the availability of facilities and funds.

(a) Training Centre or Seminar on Fisheries Administration

(b) Training Centre or Seminar on Fish Marketing.

(c) Training Centre or Seminar on Fishery Credit.

(Ch. I, p. 31)

APPENDIX I

LIST OF DELEGATES AND OBSERVERS

<i>Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
AUSTRALIA	Mr. D.J. Gates (Delegate)	Project Officer	Commonwealth Fisheries Office, Department of Primary Indus- try, Barton, Canberra, ACT, Australia.
	Mr. A.L. Vincent (Alternate)	Third Secretary	Australian Embassy, Karachi, Pakistan.
CEYLON	Dr. D.T.E.A. de Fonseka (Delegate)	Director	Department of Fisheries, P.O. Box 531, Colombo, Ceylon.
	Mr. S. Sivalingam (Alternate)	Research Officer	Department of Fisheries, P.O. Box 531, Colombo, Ceylon.
FRANCE	Mr. J. Domard (Delegate)	Veterinary Inspector	Chief of the Fisheries Service, Papeete, Tahiti, French Poly- nesia.
	Mr. M. Angot (Alternate)	Marine Biologist	Institute Francais d'Oceanie, Office de la Recherche, Scienti- fique et Technique, Outre Mer, B.P.4, Noumea, New Caledonia.
INDIA	Dr. B.S. Bhimachar (Delegate)	Chief Research Officer	Central Inland Fisheries Re- search Station, Barrackpore, via Calcutta, India.
INDONESIA	Mr. H. Saanin (Delegate)	Chief,	Inland Fisheries Research In- stitute, Djalan Sempur No. 1, P.O. Box 51, Bogor, Indonesia.
	Mr. V. Soesanto (Alternate)	Chief,	Research Division of Marine Re- sources, Sea Fisheries Service, 12 Djalan Kerapu, Pasar Ikan, Djakarta-kota, Indonesia.
JAPAN	Mr. N. Oka (Delegate)	Chief, Statistics & Data Section	Fisheries Agency, Kasumigaseki, Chiyoda-ku, Tokyo, Japan.
	Mr. H. Aneha (Alternate)	Third Secretary	Japanese Embassy, Karachi, Pa- kistan.
KOREA	Mr. Lee, Bong Nai (Delegate)	Director	Central Fisheries Experiment Station, Pusan, Korea.
	Mr. Lee, Sung Soo (Alternate)	Third Secretary	Korean Embassy, Saigon, Viet- nam.
	Mr. Kook, Yung Taik (Adviser)	Technician	Fisheries Bureau, Office of Ma- rine Affairs, Seoul, Korea.
FEDERATION OF MALAYA	Mr. Soong, Min Kong (Delegate)	Director of Fisheries	H.Q. Fisheries Department, P.O. Box 459, Penang, Malaya.
	Inche Abdul Halim (Alternate)	Fishery Administrative Officer	Fisheries Department, Kuala Trengganu, Malaya.
NETHERLANDS	Dr. J.J. Schuurman (Delegate)	Fresh & Brackish Water Fisheries Expert	Van Iddekingeweg 56, Groningen, Netherlands.

<i>Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
NETHERLANDS	Mr. J.W.M. von der Vossen (Alternate)	First Secretary	Royal Netherlands Embassy, Karachi, Pakistan.
PAKISTAN	Dr. M.R. Qureshi, (Delegate)	Director	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Dr. Nazir Ahmad (Alternate)	Director	Directorate of Fisheries, Sunda Road, Lahore, West Pakistan.
	Dr. A.R.K. Zubairi (Adviser)	Director	Directorate of Fisheries, Eden Building, Ramna, Dacca, East Pakistan.
	Mr. A. Ghulam Husain (Adviser)	Deputy Director	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Mr. Monirul Islam (Adviser)	Deputy Director	Central Fisheries Department, C.G.O. Building, Agrabad, Chit- tagong, East Pakistan.
	Mr. Lutfur Rahman (Adviser)	Fisheries Technologist	Fisheries Technological Labora- tory, Directorate of Fisheries, Comilla, East Pakistan.
	Mr. S.A. Jaleel (Adviser)	Assistant Director	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Mr. M.A. Burney (Adviser)	Fisheries & Gear Techno- logist	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Mr. Moinuddin Ahmed (Adviser)	Officer-in-Charge (Mekran Fisheries Development)	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Mr. Khalifa Amjad Husain (Adviser)	Assistant Director	Directorate of Fisheries, Sunda Road, Lahore, West Pakistan.
	Mr. Qadir Mohiuddin (Adviser)	Marine Production Officer	Central Fisheries Department, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Dr. A.H. Qadri (Adviser)	Professor of Zoology	University of Karachi, Univer- sity Campus, Country Club Road, Karachi, West Pakistan.
	Commander S.R. Islam (Adviser)	Hydrologist	Pakistan Navy, Naval Head- quarters, Karachi, West Paki- stan.
	Mr. S.N. Naqui (Adviser)	Director	Metereological Department, Pa- kistan Secretariat, Saddar, Karachi-3, West Pakistan.
	Dr. A.R. Ranjha (Adviser)	Officer-in-Charge	Zoological Survey Department, Isphani Building, McLeod Road, Karachi, West Pakistan.

<i>Government</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
PAKISTAN	Mr. G.S. Kehar (Adviser)	Chairman	Karachi Fishermen Cooperative Society Limited, Fish Harbour, West Wharf, Karachi-2, West Pakistan.
	Mr. Ralph L. Johnson (Adviser)	I.C.A. Adviser	White House, Chittagong, East Pakistan.
PHILIPPINES	Mr. Jose R. Montilla (Delegate)	Acting Director	Bureau, of Fisheries Diliman, Quezon City, Philippines.
	Mr. Claro Martin (Alternate)	Chief, Fisheries Research Division	Bureau of Fisheries, Diliman, Quezon City, Philippines.
THAILAND	Mr. Prida Karnasut (Delegate)	Director-General	Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.
	Mr. Sant Bandhukul (Alternate)	Deputy Director-General	Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.
U.K.	Dr. G.A. Prowse (Delegate)	Director	Tropical Fish Culture Research Institute, Batu Berendam, Malacca, Malaya.
	Mr. J.D. Bromhall (Alternate)	Deputy Director-General	Fisheries Station, C/o Cooperative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Hong Kong.
	Mr. Cheung, Wing-Hong (Adviser)	Craft Technician	Fisheries Division, Cooperative Development & Fisheries Department, Li Po Chun Chambers 11th Floor, Connaught Road, Hong Kong.
U.S.A.	Mr. V.E. Brock (Delegate)	Director	Hawaii Area, Bureau of Commercial Fisheries, U.S. Fish & Wildlife Service, P.O. Box 3830, Honolulu 12, Hawaii.
	Mr. R. Van Pagenhardt (Alternate)	Economic Officer	American Embassy, Karachi, West Pakistan.
	Miss E.F. Brooks (Adviser)	Economic Officer	American Embassy, Karachi, West Pakistan.
	Mr. R.J. Schoettler (Adviser)	Fisheries Adviser	USOM, American Embassy Saigon, Vietnam.
VIETNAM	Dr. Ngo, Ba Thanh (Delegate)	Director	Directorate of Fisheries, P.O. Box 340, Saigon, Vietnam.
	Mr. Le, Van Dang (Alternate)	Inspector	Inland Fisheries Service, Fisheries Directorate, P.O. Box 340, Saigon, Vietnam.
	Mr. Tran, Van Tri (Adviser)	Chief, Water Resources, Exploitation Service	Directorate of Fisheries, P.O. Box 340, Saigon, Vietnam.

OBSERVER ORGANIZATIONS AND NON-MEMBER GOVERNMENTS

<i>Observer Organizations</i>	<i>Name</i>	<i>Designation</i>	<i>Address</i>
G.F.C.M.	Mr. W.A. Dill (Observer)	Chief, Inland Resources Section	Biology Branch Fisheries Division, FAO of the United Nations Rome, Italy.
O.R.S.T.O.M.	Mr. M. Angot (Observer)	Marine Biologist	Institute Francais d'Oceanie, Office de la Recherche Scientifique et Technique Outre Mer, B.P. 4, Noumea, New Caledonia.
P.S.A.	Mr. J.D. Bromhall (Observer)	Senior Research Officer	Fisheries Research Station, C/o Cooperative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Hong Kong.
P.I.O.S.A.	Dr. Quadrat-e-Khuda (Observer)	Director	East Regional Laboratories, C.S.I.R.O. Dacca, East Pakistan.
	Dr. Medhi Hasan (Observer)	Head, Biochemical Division	Central Laboratories, C.S.I.R.O. Karachi Cant., West Pakistan.
P.A.A.S.	Dr. A.H. Qadri (Observer)	Professor of Zoology	University of Karachi, University Campus, Country Club Road, Karachi, West Pakistan.
S.P.C.	Mr. M. Angot (Observer)	Marine Biologist	Institute Francais d'Oceanie, Office de la Recherche Scientifique et Technique Outre Mer, B.P. 4, Noumea, New Caledonia.
U.N.	Mr. N.M. Rashed (Observer)	Acting Director	United Nations Information Centre, Karachi, Pakistan.
CANADA	Mr. L.A. Campeau (Observer)	Commercial Counsellor	Canadian High Commissioner's Office, Karachi, West Pakistan.
PORTUGAL	Mr. M. da Costa (Observer)	Chief, Pisciculture Section	Department of Inland Fish., D.A.F. CP. 250, Lourenco Marques, Mozambique, Africa.
	Mr. L. Torres (Observer)	Research Officer	Biological Section, Central Fisheries Department, Rue Dr. Antonio Candido No. 9, Lisbon, Portugal.

FOOD AND AGRICULTURE ORGANISATION

<i>Name</i>	<i>Designation</i>	<i>Address</i>
Mr. I. Ahmad	FAO Representative (Pakistan)	P.I.D.C. House (5th Floor) Kutchery Road, Karachi, W. Pakistan.
Mr. G. Saint-Pol	Legal Counsel	Office of the Legal Counsel Department of Public Relations & Legal Affairs, FAO of the United Nations, Rome, Italy.
Dr. J. Scharfe	Fisheries Technologist	Fishing Gear Section, Technology Branch Fisheries Division, FAO of the United Nations, Rome, Italy.
Mr. E.R. Kvaran	FAO/ETAP Marine Engineer	Fisheries Department P.O. Box 1505, Colombo, Ceylon.
Mr. P. Gurtner	FAO/ETAP Naval Architect	12106 C, Mahatma Gandhi Road, Ernakulam, Kerala, India.
Mr. B.W. Johnson	FAO/ETAP Harbour Engineer	C/o FAO Office 21, Curzon Road, New Delhi, India.

IPFC SECRETARIAT

<i>Name</i>	<i>Designation</i>	<i>Address</i>
Mr. J.A. Tubb	Secretary, IPFC	Regional Fisheries Officer, FAO Regional Office for Asia and the Far East, Maliwan Mansion, Phra Atit Raod, Bangkok, Thai- land.
Mr. W.A. Dill	Technical Secretary, Tech. Com. I	Chief, Inland Resources Sec., Biology Branch, Fisheries Division, FAO of the United Nations, Rome, Italy.
Dr. G.N. Subba Rao	Technical Secretary, Tech. Com. II	Assistant Regional Fisheries Officer, FAO Regional Office for Asia and the Far East, Maliwan Mansion, Phra Atit Road, Bang- kok, Thailand.
Mr. Y. Miyake	Technical Secretary, Tech. Com. II Panel C.	Fisheries Economist, Economics Branch, Fisheries Division, FAO of the United Nations, Rome, Italy.
Mrs. A. Soulier	Conference Officer	Technical Assistant, Fisheries Division, FAO Regional Office for Asia and the Far East, Maliwan Mansion, Phra Atit Road, Bangkok, Thailand.

ORGANIZING COMMITTEE, KARACHI

Dr. M.R. Qureshi	—	<i>Director, Central Fisheries Department.</i>
Mr. A.A. Jabbar	—	<i>Assistant Financial Advisor, Ministry of Food and Agriculture.</i>
Mr. A.G. Hussain	—	<i>Deputy Director, Central Fisheries Department.</i>
Mr. S.Z.H. Zaidi	—	<i>Section Officer, Ministry of Food & Agriculture.</i>
Mr. M.K. Jaskani	—	<i>Administrative Officer, Central Fisheries Department.</i>

APPENDIX II

IPFC NOMINATIONS FOR THE PERIOD BETWEEN 9TH & 10TH SESSIONS

Where Member Governments have not supplied new nominations to the Technical Committees, Panels, Sub-Committees etc., those submitted at the 8th Session have been carried over.

ADMINISTRATIVE CORRESPONDENTS

AUSTRALIA

The Secretary, Australian National FAO Committee, Department of External Affairs, Canberra, Australia.

BURMA

The Secretary, Ministry of Agriculture & Forests, Union of Burma, Rangoon, Burma.

CAMBODIA

Monsieur Dom-Saveun, Directeur du Service des Pêches, Phnom Penh, Cambodge.

CEYLON

Mr. D.T.E.A. de Fonseka, Director of Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.

FRANCE

Le Directeur, Office de la Recherche Scientifique et Technique Outre Mer, 20 rue Monsieur, Paris (7^{eme}), France.

INDIA

Dr. N. K. Panikkar, Fisheries Development Adviser, Ministry of Food and Agriculture, Department of Agriculture, Government of India, New Delhi, India.

INDONESIA

Mr. R.M. Soepanto Koesoemowinoto, Chief, Technical General Division, Sea Fisheries Service, 12 Djalan Kerapu, Djakarta, Indonesia.

JAPAN

Chief, Economic & Social Section, United Nations Bureau, Ministry of Foreign Affairs, Chiyoda-ku, Tokyo, Japan.

KOREA

Mr. Kim Myung Nyun, Director, Fisheries Bureau, Office of Marine Affairs, Seoul, Korea.

FEDERATION OF MALAYA

Mr. Abdul Rahman Hamidon, Assistant Secretary, Ministry of Agriculture, Kuala Lumpur, Federation of Malaya.

NETHERLANDS

Mr. J. de Vries, Head, Inland Fisheries Section at Sentani, Department of Economic Affairs, Hollandia, Netherlands New Guinea.

PAKISTAN

Dr. M.R. Qureshi, Director, Central Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.

PHILIPPINES

Mr. Claro Martin, Chief, Fisheries Research Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.

THAILAND

Mr. Prida Karnasut, Director-General, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.

U.K. (for Singapore, North Borneo, Sarawak)

Mr. J.A. Snellgrove, U.K. Liaison Officer, First Secretary, British Embassy, Bangkok, Thailand.

U.K. (for Hong Kong)

Commissioner for Co-operative Development and Fisheries, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.

U.S.A.

Mr. J.C. Marr, Area Director, Bureau of Commercial Fisheries, U.S. Fish & Wildlife Service, P.O. Box 3830, Honolulu 12, Hawaii.

VIETNAM

S.E. le Secrétaire d'Etat a, l'Economie Nationale, 59, Boulevard Gin Long, Saigon, Vietnam.

Government	Technical Committee I	Panel A (Inland Fisheries)	Panel B (Sea Fisheries)
AUSTRALIA	—	—	—
BURMA	U Ba Kyaw, Executive Officer, Division of Fisheries, Agricultural & Rural Development Corporation, Prome Road, Rangoon, Burma.	—	U Tint Hlaing, Division of Fisheries, Agricultural & Rural Development Corporation, Prome Road, Rangoon, Burma.
CAMBODIA	Mons. Dom Saveun, Directeur du Service des Peches, Phnom-Penh, Cambodge.	Mons. Sao-Leang, Chef du Cantonnement des Peches du Mekong, Phnom-Penh, Cambodge.	Mons. Dom-Saveun, Directeur du Service des Peches, Phnom-Penh, Cambodge.
CEYLON	Director of Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. A.S. Mendis, Research Officer, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. S. Sivalingam (Chairman), Research Officer, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.
FRANCE	Mons. J. Lemasson, Centre Technique Forestier Tropical, 45 bis, Avenue de la Belle-Gabrielle, Nogent-sur-Marne (Seine), France.	Mons. J. Lemasson, Centre Technique Forestier Tropical, 45 bis, Avenue de la Belle-Gabrielle, Nogent-sur-Marne (Seine), France.	Mons. M. Legand, Marine Biologist, Laboratoire d'Océanographie, Institut Français d'Océanie B.P. 4, Noumea, New Caledonia.
INDIA	Dr. B.S. Bhimachar, Chief Research Officer, Central Inland Fisheries Research Institute, Barrackpore (via Calcutta), India.	Shri K.H. Alikunhi, Research Officer, Central Inland Fisheries Research Sub-Station, Cuttack (Orissa), India.	Dr. G. Seshappa, Research Officer, Central Marine Fisheries Research Sub-Station, Kozhikode (Kerala State) India.
INDONESIA	Mr. H. Saanin, Chief, Institute for Inland Fisheries Research, 1 Djalan Sempur, P.O. Box 51, Bogor, Indonesia.	Mr. M. Gelar Wiraatmadja, Chief, Education Division Inland Fisheries, 17 Djalan Salabintana, Sukabumi, Java, Indonesia.	Mr. M. Unar, Fishery Research Officer, Sea Fisheries Service, 12 Djalan Kerapu, Djakarta, Indonesia.
JAPAN	Mr. Z. Nakai, Chief, Marine Resources Division, Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan.	Mr. T. Kafuku, Chief, Breeding Section, Fish Culture Division, Fresh Water Fisheries Research Laboratory, Hinomachi, Minamitamagun, Tokyo, Japan.	Mr. Z. Nakai, Chief, Marine Resources Division, Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan.
KOREA	Mr. Nam, Sang Kyu, Chief, Fishing Section, Office of Marine Affairs, Seoul, Korea.	Mr. Yang, Won Tek, Chief, Fish Culture Section, Central Fisheries Experiment Station, Pusan, Korea.	Mr. Kim, Ke Oh, Assistant Chief, Fishing Section, Central Fisheries Experiment Station, Pusan, Korea.
FEDERATION OF MALAYA	Mr. Soong Min Kong, Director of Fisheries, Department of Fisheries, P.O. Box 459, Penang, Federation of Malaya.	Mr. A.B.O. Merican, Fisheries Research Officer, Department of Fisheries, P.O. Box 459, Penang, Federation of Malaya.	Mr. D. Pathansali, Fisheries Research Officer, Department of Fisheries, P.O. Box 459, Penang, Federation of Malaya.

Government	Technical Committee I	Panel A (Inland Fisheries)	Panel B (Sea Fisheries)
NETHERLANDS	Dr. J.J. Schuurman, Fresh & Brackish Water Fisheries Expert, Van Iddekingsweg 56, Groningen, Netherlands.	Mr. J. de Vries, Head, Inland Fisheries, Department of Economic Affairs, Hollandia, Netherlands New Guinea.	—
PAKISTAN	Dr. N. Ahmad (Chairman), Director of Fisheries, Government of West Pakistan, Lahore, West Pakistan.	Mr. K.A. Hussain (Chairman), War-den of Fisheries, 2, Sanda Road, Lahore, West Pakistan.	Mr. A.G. Husain, Deputy Director, Central Fisheries Department Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.
PHILIPPINES	Mr. I.A. Ronquillo, Chief, Section of Hydrology and Fisheries Biology, Fisheries Research Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.	Dr. Herminio R. Rabanal, Chief, Section of Fresh Water Fisheries, Inland Fisheries Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.	Mr. I.A. Ronquillo, Chief, Section of Hydrology & Fishery Biology, Fisheries Research Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.
THAILAND	Mr. Chertchai Amatayakul, Chief, Division of Inland Fisheries, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	Mr. Ariya Sidhimunka, Head, Fisheries Station Section, Department of Fisheries Rajadamnern Avenue, Bangkok, Thailand.	Mr. Sant Bandhukul, Deputy Director-General, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.
U.K.	Senior Research Officer, Cooperative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.	(for N. Borneo) Mr. Chin Phui Kong, Assistant Fisheries Officer, Jesselton, North Borneo. (for Hong Kong) Senior Research Officer, Cooperative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.	Senior Research Officer, Cooperative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.
U.S.A.	Mr. John Marr, Area Director, Bureau of Commercial Fisheries, U.S. Fish & Wildlife Service, P.O. Box 3830, Honolulu, Hawaii.	Mr. Peter Wilson, Fisheries Biologist, Department of Agriculture, Agana, Guam.	Mr. Peter Wilson, Fisheries Biologist, Department of Agriculture, Agana, Guam.
VIETNAM	Mons. Le-van-Dang, Inspecteur des Peches, Chef du Service de Pisciculture, P.O. Box 340, Saigon, Vietnam.	Mons. Le-van-Dang, Inspecteur des Peches, Chef du Service de Pisciculture, P.O. Box 340, Saigon, Vietnam.	Mons. Tran-van-Tri, Chef du Service de l'Exploitation des Ressources, Aquatiques, P.O. Box 340, Saigon, Vietnam.

Government	Technical Committee II	Panel A (Craft & Gear)	Panel B (Food & Technology)	Panel C (Socio Economic & Statistics)
AUSTRALIA	Mr. C.G. Setter, Director, Fisheries Division, Department of Primary Industry, Canberra, ACT., Australia.	Mr. P.D. Lorimer, Fisheries Division, Department of Primary Industry, Canberra, ACT., Australia.	Dr. J.R. Vickery, Division of Food Preservation & Transport, CSIRO Homebush, N.S.W., Australia.	Mr. A.G. Bollen, Assistant Director, Fisheries Division, Department of Primary Industry, Canberra, ACT., Australia.
BURMA	Executive Officer, Division of Fisheries, Agricultural & Rural Development Corporation, Prome Road, Rangoon, Burma.	Executive Officer, Division of Fisheries, Agricultural & Rural Development Corporation, Prome Road, Rangoon, Burma.	—	—
CAMBODIA	Mons. Sao-Leang, Chef du Cantonnement des Peches du Mekong, Phnom-Penh, Cambodge.	Mons. Sao-Leang, Chef du Cantonnement des Peches du Mekong, Phnom-Penh, Cambodge.	—	Mons. Dom-Saveun, Directeur du Service des Peches Phnom-Penh, Cambodge.
CEYLON	Director of Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. L.F. Tisseverasinghe, Deputy Director of Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. C.E.St.C. Gunasekera, Research Chemist, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. V.L.C. Pietersz, Assistant Director of Fisheries (Administration), Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.
FRANCE	Mons. R. Serene, Adviser, Institut Oceanographique, Nha-Trang, Station Maritime de Cauda, Nha-Trang, Vietnam.	—	—	Mons. J. Domard, Veterinarian Inspector, Chef du Servicedes Peches, Papeete —Tahiti, French Polynesia.
INDIA	Shri K. Chidambaram, Asst. Fisheries Development Adviser to the Government of India, Ministry of Food and Agriculture, Department of Agriculture, New Delhi, India.	Shri D.A.S. Gnanadoss, Asst. Director of Fisheries (Craft & Tackle) Chepauk, Khalilee Mansion, 35/2 Mount Road, Madras, 2, India.	Dr. K.C. Saha, Director of Fisheries, Government of West Bengal, Calcutta, India.	Dr. C.V. Kulkarni, Director of Fisheries, Government of Maharashtra, Bombay, India.
INDONESIA	Mr. G.M. Charidjie Kasuma, Managing Director, Farmers and Fishermen's Bank, Bank Tani dan Nelayan, Nusantara 18, Djakarta, Indonesia.	Mr. R. Soenarto, Chief, Fishing Technique Research Division, Sea Fisheries Service, 12 Djalan Kerapu, Djakarta, Indonesia.	Mr. S. Darmoredjo, Technical Research Officer, Sea Fisheries Service, 12 Djalan Kerapu, Djakarta, Indonesia.	Mr. Eddiwan, Chairman, Federation of Indonesian Fisheries Cooperative, 12 Djalan Kerapu, Djakarta, Indonesia.

<i>Government</i>	<i>Technical Committee II</i>	<i>Panel A (Craft & Gear)</i>	<i>Panel B (Food & Technology)</i>	<i>Panel C (Socio Economics & Statistics)</i>
JAPAN	Mr. T. Kitahara, Chief, Statistics & Data Section, Resources Division, Fisheries Agency, Kasumigaseki, Chiyoda-ku, Tokyo, Japan.	Mr. S. Takayama, Chief, Fishing Gear & Method Division, Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan.	Dr. H. Higashi, Chief, Marine Product Utilization Division, Tokai Regional Fisheries Research Laboratory, Tsukishima, Chuo-ku, Tokyo, Japan.	Mr. N. Oka, Chief, Fishery Statistics Section, Statistics & Survey Division, Fisheries Agency, Kasumigaseki, Chiyoda-ku, Tokyo, Japan.
KOREA	Mr. Lee, Bong Nae, Director, Central Fisheries Experiment Station, Pusan, Korea.	Mr. Chuong, Bu Kwan, Fishery Technician, Fishing Station, Central Fisheries Experiment Station, Pusan, Korea.	Mr. Lee, Bong Nae (Chairman), Director, Central Fisheries Experiment Station, Pusan, Korea.	Mr. Ro, Jai Dong, Fishery Technician, Fisheries Bureau, Office of Marine Affairs, Seoul, Korea.
FEDERATION OF MALAYA	Mr. V. Selvarajah, Fisheries Research Officer, Fisheries Department, P.O. Box 459, Penang, Federation of Malaya.	Mr. J. Carvalho, Principal, Marine Fisheries School, Fisheries Department, P.O. Box 459, Penang, Federation of Malaya.	Mr. V. Selvarajah, Fisheries Research Officer, Fisheries Department, P.O. Box 459, Penang, Federation of Malaya.	Mr. Abdul Halim, (Chairman), Fisheries Administrative Officer, Fisheries Department, Kuala Trengganu, Federation of Malaya.
NETHERLANDS	—	Mr. W.A. Mackenzie, Inspector of Sea Fisheries, Department of Economic Affairs, Hollandia, Netherlands New Guinea.	—	—
PAKISTAN	Mr. S.A. Jaleel (Chairman), Assistant Director (Socio-economics), Central Fisheries Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.	Mr. M.A. Burney (Chairman), Fisheries & Gear Technologist, Central Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.	Mr. S.H. Chowdhury, Fisheries Technologist, Central Fisheries Department, Chittagong, East Pakistan.	Mr. S.A. Jaleel, Assistant Director (Socio-economics), Central Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.
PHILIPPINES	Mr. S.B. Rasalan, Chief, Marine Fisheries Division, Bureau of Fisheries, Dilliman, Quezon City, Philippines.	Mr. S.B. Rasalan, Chief, Marine Fisheries Division, Bureau of Fisheries, Dilliman, Quezon City, Philippines.	Mr. Silvestre V. Bersamin, Chief, Section of Technological Research, Fisheries Research Division, Bureau of Fisheries, Dilliman, Quezon City, Philippines.	Mr. Justo R. Montemayor, Chief, Section of Statistics & Socio-Economics, Fisheries Research Division, Bureau of Fisheries, Dilliman, Quezon City, Philippines.
THAILAND	Mr. Tuanthai Bamraj-Arinpai, Chief, Division of Fisheries Investigation, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	Mr. Sanan Ruamragsa, Senior Technical Fisheries Officer, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	M.C. Kosol Suriyathit Suriyong, Senior Technical Fisheries Officer, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	Mr. Padh Tavaranusorn, Head, Socio-economics Section, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.

Government	Technological Committee II	Panel A (Craft & Gear)	Panel B (Food & Technology)	Panel C (Socio Economics & Statistics)
U.K.	Fisheries Officer, Co-operative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.	Fisheries Officer, Co-operative Development & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.	Marketing Officer, Co-operative Department & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.	Marketing Officer, Co-operative Department & Fisheries Department, Li Po Chun Chambers, 11th Floor, Connaught Road, Central, Hong Kong.
U.S.A.	Mr. A.W. Anderson, Assistant Director, Bureau of Commercial Fisheries, U.S. Fish & Wildlife Service, Washington D.C. 25, U.S.A.	Mr. Herbert Mann, Gear Specialist, Hawaii Area, Bureau of Commercial Fisheries, P.O. Box 3830, Honolulu, Hawaii.	-	-
VIETNAM	Dr. Ngo-ba-Thanh, Directeur, Direction des Peches, P.O. Box 340, Saigon, Vietnam.	Mons. Tran-van-Tri, Chef du Service de l'Exploitation des Ressources Aquatiques, P.O. Box 340, Saigon, Vietnam.	Dr. Ngo-Ba-Thanh, Directeur des Peches, Direction des Peches, P.O. Box 340, Saigon, Vietnam.	Mons. Nguyen-van-Tich, Chef du Bureau Socio-Economique, Direction des Peches, P.O. Box 340, Saigon, Vietnam.

IPFC SUB-COMMITTEES

Government	Fish Marketing Sub-Committee	Hilsa Sub-Committee	Rastrelliger Sub-Committee	Chanos Sub-Committee	Fish Culture in Rice Fields Sub-Committee
AUSTRALIA	Mr. A.G. Bollen, Assistant Director, Fisheries Division, Department of Primary Industry, Canberra, ACT., Australia.	—	—	—	—
BURMA	—	Executive Officer, Division of Fisheries, Agricultural & Rural Development Corporation, Prome Road, Rangoon, Burma.	—	—	—
CAMBODIA	Mons. Dom-Saveun, Directeur du Service des Peches, Phnom Penh, Cambodge.	—	—	—	—
CEYLON	Mr. L.D. Gunasekera, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	—	Dr. T.P. Goonewardena, Research Officer, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. T.G. Pillai, Supdt. Brackish-water Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.	Mr. H.A. Indrasena, (Chairman), Supdt. Fresh Water Fisheries, Department of Fisheries, P.O. Box 531, Colombo-3, Ceylon.
FRANCE	—	—	—	—	—
INDIA	Shri K.R. Srivatsa, Director of Fisheries, Government of Gujarat, Ahmedabad, India.	Dr. (Mrs.) Sarojini R. Pillay, Research Officer, Central Inland Fisheries Research Station, 47/1 Strand Road, Calcutta-7, India.	Shri M.D. Menon, Fisheries Officer, Indian Norwegian Project, Quilon (Kerala State), India.	—	—
INDONESIA	Mr. R. Soekarno, Chief, Socio-economics Division, Inland Fisheries Service, 2 Nusantara, Djakarta, Indonesia.	—	Mr. V. Soesanto (Chairman), Chief, Biological Section, Sea Fisheries Service, 12 Djalank Kerapu, Djakarta, Indonesia.	Mr. R. M. Tjiptoaminoto, Chief, Inland Fisheries Service, East Java Province, Surabaja, Java, Indonesia.	Mr. M. Ahjar, Chief, Inland Fisheries Services, West Java Province, 17 Djalan Wasukentjana, Bandung, Indonesia.

<i>Government</i>	<i>Fish Marketing Sub-Committee</i>	<i>Hilsea Sub-Committee</i>	<i>Rastrelliger Sub-Committee</i>	<i>Chanos Sub-Committee</i>	<i>Fish Culture in Rice Fields Sub-Committee</i>
JAPAN	Mr. N. Oka, (Chairman), Chief, Fishery Statistics Section, Statistics & Survey Division, Fisheries Agency, Kasumigaseki, Chiyoda-ku, Tokyo, Japan.	—	—	—	Mr. T. Kafuku, Chief, Breeding Section, Fish Cultural Division, Fresh Water Fisheries Research Laboratory, Hinomachi Minamitamagun, Tokyo, Japan.
KOREA	Mr. Han, Sin Wook, Chief, Processing Section, Fisheries Bureau, Office of Marine Affairs, Seoul, Korea.	—	—	—	Mr. Kim, UI Bao, Fresh Water Fish Culture Specialist, Central Fisheries Experiment Station, Pusan, Korea.
FEDERATION OF MALAYA	Mr. Heong Kok Hee, Distribution & Marketing Section, Fisheries Department, P.O. Box 459, Penang, Federation of Malaya.	—	Mr. D. Pathansali, Fisheries Research Officer, Fisheries Department, P.O. Box 459, Penang, Federation of Malaya.	—	Mr. A. B. O. Merican, Fisheries Research Officer, Department of Fisheries, P.O. Box 459, Penang, Federation of Malaya.
NETHERLANDS	—	—	—	—	—
PAKISTAN	Mr. S.A. Jaleel, Assistant Director, Central Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.	Dr. M. R. Qureshi, (Chairman), Director, Central Fisheries Department, Karachi Fish Harbour, West Wharf, Karachi-2, Pakistan.	—	—	Dr. A.R.K. Zubairi, Director of Fisheries, East Pakistan Government, Eden Gardens, Dacca, East Pakistan.
PHILIPPINES	Mr. Justo R. Montemayor, Chief, Section of Statistics & Socio-economics, Fisheries Research Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.	—	Mr. I. A. Ronquillo, Chief, Section of Hydrology & Fisheries Biology, Fisheries Research Station, Bureau of Fisheries, Diliman, Quezon City, Philippines.	Dr. H.R. Rabanal, (Chairman), Chief, Section of Fresh Water Fisheries, Inland Fisheries Division, Bureau of Fisheries, Diliman, Quezon City, Philippines.	Mr. P. Acosta, Fish Culturist, Inland Fisheries Division, Bureau of Diliman, Quezon City, Philippines.

Government	Fish Marketing Sub-Committee	Hilsa Sub-Committee	Rastrelliger Sub-Committee	Chanos Sub-Committee	Fish Culture in Rice Fields Sub-Committee
THAILAND	Mr. Padh Tavaranusorn, Head, Socio-economics Section, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	—	Mr. Sant Bandhukul, Deputy Director-General, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	Mr. Umpol Pongsuwana, Chief, Freshwater Pond Culture Section, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.	Mr. Umpol Pongsuwana, Chief, Freshwater Pond Culture Section, Department of Fisheries, Rajadamnern Avenue, Bangkok, Thailand.
U.K.	Marketing Officer, Li Po Chun Chambers, 11th Floor, Connaught Road, Central Hong Kong.	—	—	Dr. G.A. Prowse, Director, Tropical Fish Culture Research Institute, Batu Berendam, Malacca, Malaya.	Dr. G.A. Prowse, Director, Tropical Fish Culture Research Institute, Batu Berendam, Malacca, Malaya.
U.S.A.	—	—	—	—	—
VIETNAM	Mons. Nguyen-van-Tich, Chef du Bureau Socio-Economique, P.O. Box 340, Saigon, Vietnam.	—	—	Mons. Le-van-Dang, Inspecteur des Peches, Chef du Service de Pisciculture, P.O. Box 340, Saigon, Vietnam.	Mons. Le-van-Dang, Inspecteur des Peches, Chef du Service de Pisciculture, P.O. Box 340, Saigon, Vietnam.

APPENDIX III

LIST OF DOCUMENTS

INCIDENTAL PAPERS :

IPFC/C61/INC	1	Provisional List of Delegates and Observers.
	2	Provisional List of Documents.
	3	Draft Programme.
	3 Rev. 1	Programme.
	4	IPFC Nomination Forms.
	5	General Information.
	6	IPFC Nominations for the period between 9th and 10th Session.
	7	Local Master's Handbook.
	8	Opening Statements.
	9	Secretariat Action.
	10	Classification of Documents.
	11	Secretary's Report on Credentials.
	12	Steering Committee.
	13	Tour Programme—Sat. Jan., 14th.
	14	Sea Cruise—Sunday, Jan. 15th.
	15	Evening Programme—16–22 Jan. 1961.
	16	Film Evening.

WORKING PAPERS :

IPFC/C61/WP	1 (E)	Agenda-9th Session of the Indo-Pacific Fisheries Council.
	1 (F)	ditto
	2	Report of the Executive Committee.
	3	Prospectus for a Training Centre on Fish Processing—Preliminary Draft.
	4	Proposed Method of Operation of Council Technical Committees during the Session.
	5	Provisional Agenda-Technical Committee II.
	*6	Provisional Report for Inter-Sessional Period 1959-60 by Technical Committee I.
	*6 Add. 1	Technical Committee I—Some information about fishculture in Ricefields in Indonesia.
	*6 Add. 2	Technical Committee I—Panel B Sea Fisheries-Indonesia.
	*6 Add. 3	Technical Committee I—Panel B ,, ,, -Japan.
	*6 Add. 4	Technical Committee I—Panel B ,, ,, -Australia.
	*6 Add. 5	Technical Committee I—Report to Mackerel sub-Committee-Ceylon.
	*6 Add. 6	Technical Committee I—Panel B Sea Fisheries-Ceylon.
	*6 Add. 7	Technical Committee I—Panel A Inland Fisheries-Ceylon.
	*6 Add. 8	Technical Committee I—Present status of research and development in Vietnam.
	*6 Add. 9	Technical Committee I—Present status of Fishculture development in Vietnam.
	*7	Technical Committee II—Draft 1.
	*7 Add. 1	Technical Committee II—Panel A-Federation of Malaya.
	*7 Add. 2	Technical Committee II—Panel B-Indonesia.
	*7 Add. 3	Technical Committee II (Revision of first draft with report of information on Ceylon).

* In short supply for tabling only.

IPFC/C61/WP	*8	Fisheries Products Manual.
	9	Incidence of Ciguatera in the Indo-Pacific Region.
	10	IPFC 8th Session Recommendations on Technical Assistance.
	*11	Draft Amendments to Agreement and Rules of Procedure of the IPFC in the light of Conference Resolutions 43/57 and 46/57.
	11 Rev. 1	Ditto (revised).
	12	Netherlands Proposal for the Amendment to the IPFC Agreement.
	13	A Note on Cultivation of Milk Fish in Rice Fields in Thailand.
	14	UNICEF/FAO Cooperative Projects.
	15	Progress Report on Arrangements for a World Scientific Meeting on the Biology of Tunas and Related Species.
	16	Government Credit Schemes for Fishery Industries in the Indo-Pacific Region.
	16 Add. 1	Ditto.
	17	Fish Transport Organization and Facilities in the selected Fishing Centres in the Indo-Pacific Region.
	18	Some Information on Fishculture in the Ricefields of Indonesia.
	19	A Note on the Hilsa Fisheries Investigations in India during 1958-59 and 1959-60.
	20	The Rastrelliger Fishery Research Programme in Thailand.
	21	Hilsa Investigation in Pakistan.
	22	Review of Government Fish Marketing Activities in the Indo-Pacific Region (Revised).
	22 Add. 1	Ditto.
	23	Government Departments concerned with fish marketing, their personnel and training facilities in the Indo-Pacific Region (Draft).
	23 Add. 1	Ditto.
	24	Provisional Agenda-Technical Committee I.
	25	Note on Technical Assistance in South East Asia.
	26	Provisional Agenda-Panel C-Technical Committee II.
	27	Report of the Fish Marketing Committee (Draft).
	28	Provisional Agenda-Fish Marketing Sub-Committee.
	29	Comparisons of Efficiency of Plankton Nets.
	*30	Research Activities on Marine & Freshwater Agriculture and Propagation-Central Fisheries Experiment Station—Pusan, Korea.
	*31	Research Activities on Oceanography & Marine Resources in Korea, 1960.
	32	Investigation and Assessment of the Financial Situation of Fishermen in the Indo-Pacific Region.
	33	The Special Fund—its Application in the Field of Fisheries.
	*34	Current Fisheries Processing Industry & Research Activities in Korea.
	35	International Meeting on Fish Meal, 20 March—29 March, 1961.
	36	Bibliography on Fish Marketing for the Indo-Pacific Region.
	37	Notes on the topics for discussion by Technical Committee II.
	38	Topics of discussion and references—Fish Marketing Sub-Committee.
	*39	A Fishery Development in Korea.
	40	Topics of discussion and references-Panel C, Technical Committee II.
	41	Programme of work for Technical Committee II.
	42	Preliminary Report on the Experiments with Marutoku-B net and a 45cm×90cm net of N. O. Bolting silk off Trincomalee, Ceylon, during Oct. 1960.
	43	Technical Committee II — Elections.
	44	Technical Committee II — Publication of Technical Papers.
	45	Work Programme—major fields of activity for Technical Committee I,

* In short supply for tabling only.

IPFC/C61/WP	46	Proposal by the Delegate for the Govt. of Indonesia for the Amendment of the Agreement and the Rules of Procedure of IPFC.
	47	Proposal by the Delegate for the Govt. of Netherlands for the Amendment of the Agreement and the Rules of Procedure of the IPFC.
	48	Proposal by the Delegate for the Govt. of Japan.
	49	Executive Committee Report.
	50	Proposal by the Delegate for the Govt. of the Philippines for the Amendment of the Agreement and the Rules of Procedure of the IPFC.
	51	Report-Amendments to the IPFC Agreement and Rules of Procedure.
	52	Technical Committee II – Report of the Steering and Drafting Committee.
	53	Report-Amendments to the IPFC Agreement and Rules of Procedure.
	54	Technical Committee I – Editorial Committee.
	55	Invitation for IPFC 10th Session.

TECHNICAL PAPERS : *Note:* Where Abstracts and/or Summaries have been provided these have been embodied in the paper.

		Subject
IPFC/C61/TECH.	1	Processing the flesh of the pearl oyster (<i>Pinctada vulgaris</i> Schum)..... by C. Gunsekera
		Food Technology
	2	Some aspects of prawn drying in Kerala..... by S.N. Rao and A.G. Vasavan
		Food Technology
	3	A review of the salt fish industry of Kerala..... by S.N. Rao and A.G. Vasavan
		Food Technology
	4	Experience in fishing boat building applicable to the IPFC Region..... by J.O. Traung
		Fishing Craft
	5	A new method for refining of shark liver oil on commercial scale and recovery of Vitamin 'A' by partial saponification for production of standard quality as well as higher Vitamin 'A' potency oil... by S.A. Ali and L. Rahman
		Food Technology
	6	Fishing boats in West Pakistan..... by M.A. Burney
		Fishing Craft
	7	Recipes from canned Galangong (<i>Decapterus</i> Sp.), Salmon Style..... by S.V. Bersamin, D. Calvez and F.R. Gonzales
		Food Technology
	8	Preliminary studies on the comparative chemical composition of the different commercial brands of Patis in the Philippines..... by S.V. Bersamin and R.S.J. Napugan
		Food Technology
	9	Effectiveness of sorbistat on the storage and keeping quality of dried fishery products..... by S.V. Bersamin, N. Macalincag and A.S. Legaspi
		Food Technology
	10	Effectiveness of biostat (Oxytetracycline Hydrochloride) in maintaining the freshness of Hasa-Hasa (<i>Rastrelliger brachysomus</i> , Bleeker)..... by J.I. Sulit, G. Guevara, N. Macalincag and A. Santos
		Food Technology
	11	Some seaweeds consumed fresh in the Philippines... by S.V. Bersamin, S.V. Laron, F.R. Gonzales and R.B. Banania
		Food Technology

		Subject
IPFC/C61/TECH. 12	Coöperative purchasing business of women's groups in fishing villages of Japan by S. Matsumura	Socio-economics
13	Application of a net gauge to midwater trawling . . by S. Takayama and T. Koyama	Fishing Gear
14	Development of an agent for treating synthetic and natural fiber nets by S. Takayama and T. Shimozaki	Fishing Gear
15	Studies on the mid-water trawl gears and the mid-water telemeters by C. Hamuro	Fishing Gear
16	Fresh water fish culture trial—Brunei State. by Hamidon bin Awang Damit	Fish culture
17	Regulations to ensure the safety of fishing vessels . by P.D. Lorimer	Fishing Craft
18	Fisheries loan fund by K. Suwanarat	Socio-Economics
19	An attempt to use Radiophosphorus (P^{32}) for productivity determination of the sea by R. Fukai, A. Soegiarto and S. Ruamragsa	Biology
20	Comparative studies on measurements of the weight of the volume of plankton samples—A preliminary account by Z. Nakai & K. Honjo	Biology
21	Fish liver oil in Indonesia by B. Lubis	Food Technology
22	A preliminary report on experiments of fish drying with an artificial dryer by S. Darmoredjo	Food Technology
23	An observation on the development of tuna-like fishes trolling by motorized vessels by M. Unar	Fishing Gear
24	Economic marine algae of Ceylon by M. Durairatnam	Food Technology
25	Notes on the life and habits of the adults and larval stages of <i>Macrobrachium carinus</i> (Fab.) by S.W. Ling and A.B.O. Merican	Biology
26	A study of drift in the North Malacca Strait from salinity determinations by V. Selvarajah	Oceanography
27	A preliminary study in the preservation of salt fish in cold rooms by V. Selvarajah	Food Technology
28	A preliminary report on the <i>Rastrelliger</i> fishery in Malaya by D. Pathansali	Biology
29	Fisheries statistics of Thailand by S. Suwannaonta	Statistics
30	Plankton studies in Manila Bay—Standardization of plankton nets & plankton volumes by I.A. Ronquillo & E. Bernabe	Biology

		Subject
IPFC/C61/TECH. 31	Status and progress of Chanos fishery in the Philippines by H.R. Rabanal	Biology
32 (ABS)	Present status of research and development in connection with the Chanos fisheries in Vietnam . . by Le Van Dang	Biology
33 (ABS)	A preliminary brief report on artificial Mullet (Mugil sp.) culture in Korea by Agriculture and Propagation Section, Central Fisheries Experiment Station, Korea	Biology
34 (ABS)	Tagging Rastrelliger in Thailand by S. Bandhukul	Biology
35	The Tropical Fish Culture Research Institute, Malacca, Federation of Malaya by G.A. Prowse	Biology
36	The economics of fish culture by G.A. Prowse	Biology
37	Remarks on pisciculture and fisheries in Mozambique by M. da Costa	Biology
38	Recent advances in pisciculture practices in Pakistan by N. Ahmad	Biology

SYMPOSIUM: "How to formulate programmes of fisheries research and technological improvements, particularly in fish handling required for the implementation of national policies for fisheries development and methods of assessing progress in these programmes".

IPFC/C61/SYM. 1	Prospectus — IPFC 9th Session Symposium.	
2	The Formulation of a Fisheries Development Programme by Tham Ah Kow.	
3	The Role of the Technological Laboratory in the Rapid Development of the fish Processing Industry in India by R. Venkataraman and S.A. Beatty.	
4	Methods of assessing Progress in National Fisheries Department Programmes by Department of Fisheries, Canada.	
5	Establishment of a National Policy of Fisheries Research by C.P. Idyll.	
6	The Organization of Fisheries Scientific Research by F.D. Ommanney.	
7	Analysis of the Organization and Research Programme of an Inland Fisheries Administration by J.J. Schuurman.	
8 (F)	Les Problemes de la Peche dans les Territoires Francais du Pacifique, leurs Particularites et leur Generalisation by M. Angot.	
(E)	Fishery Problems in the French Territories of the Pacific, General and Specific by M. Angot.	
9	Federal Commercial Fishery Administration in the United States by A.J. Suomela.	

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CONTRIBUTED PUBLICATIONS: *Note:* The following publications have been made available to the Council in limited supply. These have been distributed as widely as possible. When numbers of copies have been small, distribution has been limited to Heads of Delegations only.

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